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FOOD TECHNOLOGY ABSTRACTS

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FOOD
TECHNOLOGY
ABSTRACTS

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ABBREVIATIONS

**Used in addresses only*

A	ampere
AAS	atomic absorption spectrometry
abstr.	abstract
*Acad./ Akad.	Academy/Akademie, etc.
ACC	1-aminocyclopropane-1-carboxylic acid
*Agric.	Agriculture, Agricultural, etc.
*Agron.	Agronomic, etc.
a.i.	active ingredient
Anon.	Anonymous
AOAC	Association of Official Analytical Chemists
approx.	approximately
ARS	Agricultural Research Service
*Ass.	Association
atm	atmosphere
a_w	water activity
*Bact/Bakt.	Bacteriology, Bakteriologie, etc.
BHA	butylated hydroxyanisole
BHT	butylated hydroxytoluene
*Biochem.	Biochemistry, etc.
*Biol.	Biology, etc.
*Bot.	Botanical, etc.
bp	base pair(s)
b.p.	boiling point
Bq	Becquerel
Btu	British thermal unit
cal	calorie
cd	candela
*Cent.	Central, etc.
cfu	colony forming unit
*Chem.	Chemistry
Ci	curie
coeff.	coefficient
*Coll.	College
Co.	Company
conc.	concentrated
concn.	concentration
Corp.	Corporation
CSIRO	Commonwealth Scientific and Industrial Research Organization
cv.	cultivar
cwt	hundredweight
Da	Dalton
DE	dextrose equivalent
*Dep.	Department
*Dev.	Development, etc.
DFD	dark firm dry
diam.	diameter
dil.	dilute
*Div.	Division
DM	dry matter, Deutsche Mark
DSC	differential scanning calorimetry
E	East, Eastern, etc.
ECD	electron capture detection
EDTA	ethylenediaminetetra-acetic acid
EEC	European Economic Community/European Communities
Eh	oxidation-reduction potential
ELISA	enzyme-linked immunosorbent assay
EM	electron microscopy/ micrograph(s)
*Eng.	Engineering, etc.
EPA	Environmental Protection Agency
*Exp.	Experiment, etc.
*Fac. Fak.	Faculty, etc.
FAO	Food & Agriculture Organization
FDA	Food & Drug Administration
*Fed.	Federal, Federation, etc.
FIA	flow injection analysis
FID	flame ionization detection
fl oz	fluid ounce
f.p.	freezing point
FPD	flame photometric detection
ft	foot, feet
g	gram
GC	gas chromatography
g_n	gravity
gal	gallon
gf	gram-force
GLC	gas-liquid chromatography
*Gov.	Government
GRAS	generally regarded/ recognized as safe
h	hour
ha	hectare
HACCP	Hazard Analysis Critical Control Point
HDPE	high density polyethylene
hl	hectolitre (100 l)
*Hort.	Horticultural, etc.
hp	horse power
HPLC	high performance/ pressure liquid chromatography
HTST	high temperature short time
Hz	hertz (frequency cycles/s)
Inc.	Incorporated
*Ind.	Industry, etc.
*INRA	Institut National de la Recherche Agronomique
*Inst.	Institute, etc.
*Int.	International
IR	infrared
IU	international unit
J	joule
kb	kilobase(s)
K	Kelvin
KK	Kabushiki Kaisha (Co. Ltd.)
*Ltd.	Limited
l	litre
*Lab.	Laboratory
lb	pound
lbf.	pound-force
LDPE	low density polyethylene
m-equiv.	milli-equivalent
M	molar concentration
*MAFF	Ministry of Agriculture, Fisheries & Food
max.	maximum
*Mech.	Mechanical, etc.
*Med.	Medicine, etc.
*Microbiol.	Microbiology
min	minute (time)
min.	minimum
*Min.	Ministry
mol	mole
mol. wt.	molecular weight
m.p.	melting point
MPN	most probable number
M_r	relative molecular mass
MS	mass-spectrometry
N	Newton (kg m/s^2)
N.	North, Northern, etc.
N	normal concentration
NAA	neutron activation analysis
*Nat.	National
NIR	near infrared
NMR	nuclear magnetic resonance
NPU	net protein utilization
*Nutr.	Nutrition, etc.
*Org.	Organization
oz	ounce
P	Poise
P	probability
Pa	pascal (N/m^2)
PAGE	polyacrylamide gel electrophoresis
PAH	polynuclear aromatic hydrocarbons
*Path.	Pathology
PCB	polychlorinated biphenyls
PCR	polymerase chain reaction
PER	protein efficiency ratio
PET	polyethyleneterephthalate
pfu	plaque forming unit
*Physiol.	Physiology, etc.
p.p.b.	parts per billion
p.p.m.	parts per million

FOOD PROCESSING

605

Sefa-Dedeh (S) and Saalia (FK). **Extrusion of maize-cowpea blends in a modified oil expeller.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 160-168

A laboratory oil expeller was modified by using a press cylinder without openings for expelling the oil. Central composite rotatable design for k = 3 was used to study the effects of process variables, cowpea level (0-25%), feed moisture (10-25%) and barrel temp. (130-200°C) on product indices (moisture, expansion index, bulk density, water absorption, extractable solids, swell vol. and the degree of gelatinization of flour from the extrudate). Regression models developed to predict product indices were significant and showed no significant lack of fit. The model for moisture content of the extrudate had an R^2 of 0.98. Product moisture was influenced by the amount of cowpea in the feed, the temp. of extrusion and feed moisture. Furthermore, the product moisture measured at each cowpea level was dependent on the temp. of extrusion. The model for product expansion index showed that this index decreased with feed moisture and the cowpea level. Regression models for bulk density, water absorption, extractable solids and the max. swell vol. of flour from the extrudate were influenced by the process variables. The degree of gelatinisation decreased with cowpea level and increased with extrusion temp. AA

FOOD PACKAGING

606

Goulas (AE), Riganakos (KA), Ehlermann (DAE), Demertzis (PG) and Kontominas (MG). **Effect of high-dose electron beam irradiation on the migration of DOA and ATBC plasticizers from food-grade PVC and PVDC/PVC films, respectively, into olive oil.** *Journal of Food Protection* 61(6); 1998; 720-724

FOOD ENGINEERING AND EQUIPMENT

607

Ilo (S) and Berghofer (E). **Kinetics of thermomechanical destruction of thiamin during extrusion cooking.** *Journal of Food Science* 63(2); 1998; 312-316

Maize grits were extrusion cooked in a CM45-F conical, counter-rotating twin-screw extruder, at different barrel temp. (140-200°C), feed moistures (11.8-14.2% w.b.), feed rates (37-51 kg/h), screw speeds (65-81 rpm), and initial thiamin concn. (9-93 mg/kg). Residence time distribution was measured by a dye tracer technique. A first-order rate equation was used to model the reaction kinetics, which allowed the calculation of the destruction rate constant using residence time distribution curves. The k-values were most dependent on barrel temp., feed moisture, and screw speed. The destruction rate constant of thiamin during extrusion cooking was a function of product temp. and shear stress. AA

608

Bon (J), Simal (S), Rossello (C) and Mulet (A). **Drying characteristics of hemispherical solids.** *Journal of Food Engineering* 34(2); 1997; 109-122

A diffusional model has been proposed to simulate the drying curves of hemispherical bodies. The equation representative of the mass transfer in terms of Fick's law for a hemispherical shaped body has been solved by separation of variables. By using this sol. and the optimization capabilities included in Microsoft Excel 5.0™ spreadsheet, an effective diffusivity coeff. was identified for potatoes at different air drying temp. (30, 50, 70 and 90°C). Effective diffusivity varied with air drying temp. according to the Arrhenius equation. Experimental data obtained using the same and different experimental conditions of air drying temp. (from 30 to 90°C) and sample size (hemispheres with radius from 0.0128 to 0.0230 m) could be predicted by using the proposed model (%var = 99.7%). The importance of taking into account the real geometry of the solid was evaluated by using the sol. for a spherical shaped body. The model developed for a sphere provided less satisfactory results in the simulation of the drying experiments mentioned (%var = 96.6%). AA

609

Hulbert (GJ), Litchfield (JB) and Schmidt (SJ). **Determination of convective heat transfer coefficients using 2D MRI temperature mapping and finite element modelling.** *Journal of Food Engineering* 34(2); 1997; 193-201

Finite element modelling was used in combination with 2D MRI temp. mapping to calculate fluid to particle convective heat transfer coeff. (h_{fp}) across the surfaces of a carrot particle being heated with 80°C water with an av. velocity of 4.4 cm/s. Heat transfer in the region of interest (image acquired from center of sample) was essentially two-dimensional because of the length of the carrot sliver. The h_{fp} at each surface was determined by trial and error matching of temp. contours in the model to those in the MRI image. Calculated values of h_{fp} (117-389 W/m^2 K) were within the range of those reported in the literature. The major advantages of this method are that the actual shape of the food particle is used in the model, and it can be utilized in applications where the particle does not heat uniformly from all directions. AA

610

Alhamdan (A) and Sastry (S). **Residence time distribution of food and simulated particles in a holding tube.** *Journal of Food Engineering* 34(3); 1997; 271-292

Residence time distribution (RTD) was determined for food and simulated particles flowing in a holding tube, as affected by particle shape (cube, cylinder, sphere), particle concn. (10, 20 and 30% w/v), particle type (potato, carrot, turkey, green peas, and polystyrene), fluid viscosity (0.0% CMC, 0.5% CMC, 1.0% CMC), bulk flow rate (5.81, 7.28 and 8.71 x 10^{-4} m^3/s) and SSHE shaft speed (30, 60, and 90 rpm). Residence times of tracer particles were recorded by a video camera equipped with a timer. Cylindrical particles remained in the holding tube longer than cubic particles. Increasing particle concn. and bulk flow rate tended to decrease mean normalized particle residence time (MNPRT). Increasing fluid viscosity decreased MNPRT significantly, apparently due to the strong lift action of the fluid on the particles. Although turkey particles were denser than other food particles, they had smaller residence times than the carrot and potato particles. The MNPRT of green peas was found to be significantly higher than that of polystyrene spheres. Swept-surface heat exchanger shaft speed did not influence MNPRT in the holding tube. The residence time distribution curves were narrowed by decreasing particle concn. and increasing bulk flow rate, and by using high viscosity fluids and cubic particles. The longest particle residence time was 5.3 times the av. bulk residence time. The fastest particle did not exceed 1.8 times the av. bulk velocity. This finding is within the conservative value of 2.0 considered safe in sizing holding tubes in aseptic processing systems. AA

611

Sablani (SS), Ramaswamy (HS) and Mujumdar (AS). **Dimensionless correlations for convective heat transfer to liquid and particles in cans subjected to end-over-end rotation.** *Journal of Food Engineering* 34(4); 1997; 453-472

Dimensionless correlations, for estimating forced convection heat transfer coeff. in cans with end-over-end rotation, were investigated using multiple regression of significant dimensionless groups. Data on overall heat transfer coeff., U, and fluid to particle heat transfer coeff., h_{fp}, were obtained for several processing conditions, and analyzed separately for single and multiple particles in the can. Heat transfer to a single particle was modeled based on particle settling theory, with terminal velocity resulting from the combined forces of gravity, buoyancy, centrifugal and drag acting on it, during end-over-end rotation. In the presence of multiple particles, heat transfer to the moving liquid/particles system was modeled as in a packed bed. Attempts were made to account for the particle shape and size effects on U and h_{fp} by including particle sphericity (ψ = surface area of an equivalent sphere/surface area of the particle) and particle equivalent diam. (as diam. of sphere of vol. equal to that of particle, d_e) into the correlation equation. For U with a single particle in the can, the Nusselt number (Nu) was related to Reynolds number (Re), Prandtl number (Pr) and relative can headspace; while with multiple particles, Re, Pr, d_e, the ratio of particle to liquid concn. and ψ were found to be significant. For h_{fp}, with a single particle in the can, Nu was related to Re [or Froude number (Fr)], Pr, density simplex (a), relative can headspace and the ratio of the sum of the diam. of rotation and diam. of the can to the can diam., while with multiple particles, Re (or Peclet number), ratio of particle to liquid thermal conductivity, the particle to liquid concn. ratio and particle sphericity were found to be significant parameters. AA

612

Hayakawa (K-i), Giannoni-Succar (EB), Huang (F) and Zhou (L). **Use of the empirical temperature response function for modified Duhamel's theorem application.** *Journal of Food Engineering* 34(3); 1997; 331-353

A modified Duhamel's theorem developed previously requires a normalized temp. response function of a body of conduction heat transfer. Empirical response functions based on parameters f and j were used in the theorem application since many foods were irregularly shaped and analytical response functions were not available for such foods. Using this theorem, 30 analytical formulae were derived to estimate the temp. of foods undergoing several different heat transfer processes with two- or four-step functional changes in heat exchange medium temp. and convective surface heat transfer coeff. Sample applications for these analytical formulae include detn. of the j value for the cooling phase of a heat transfer process using one derived formula. AA

613

Torres (AP), Oliveira (FAR) and Fortuna (SP). **Residence time distribution of liquids in a continuous tubular thermal processing system: Part I. Relating RTD to processing conditions.** *Journal of Food Engineering* 35(2); 1998; 147-163

A systematic experimental study on residence time distribution (RTD) in tubular flow was performed, covering a wide range of processing conditions. The flow of water in various sections of a tubular continuous thermal processing system was analysed using the classical Danckwerts approach. Methylene blue was used as tracer and different constant temp. (25-80°C) and flow rates (80-380 l/h) were tested. These conditions yielded mean residence times up to 6 min and Reynolds numbers between 1350 and 9700. Various models were fitted to the experimental data, and the dispersion model showed to yield the best fit. Peak analysis led to both accurate and precise as well as conservative parameters, when compared to other methods of parameter estimation. Results revealed that fluid dispersion in tubular flow (Peclet number) can be related to processing conditions (Reynolds number) by a power law model. Results were compared to published correlations. AA

614

Torres (AP) and Oliveira (FA). **Residence time distribution of liquids in a continuous tubular thermal processing system: Part II. Relating hold tube efficiency to processing conditions.** *Journal of Food Engineering* 35(2); 1998; 165-175

The concept of efficiency of a holding tube is essential to guarantee the safety of continuously processed fluid foods. A good prediction of efficiency allows a better control of the processing conditions, guaranteeing product safety while decreasing product quality losses due to overprocessing. Different published methods were compared to data obtained in this work and to reported data, to assess their ability to predict tube efficiency in a range of Reynolds number (Re) covering laminar, transient and turbulent flow. Furthermore, a model assuming dispersed plug flow and a power-law relation between Peclet number (Pe) and Re was developed and evaluated. Published models were shown to be, in general, conservative for both laminar and turbulent flow, but often overpredicted the experimental efficiency in the zone of $2100 < Re < 4000$. Deviations between predicted and experimental values were very considerable (errors from -25% to 90%). The model proposed has proved to be conservative over the whole range, but more accurate (errors up to 15%). AA

615

Yeh (A-I) and Jaw (Y-M). **Modelling residence time distributions for single screw extrusion process.** *Journal of Food Engineering* 35(2); 1998; 211-232

The residence time distribution (RTD) of rice flour during single-screw extrusion cooking at various operating conditions and screw profiles has been measured and a model describing RTD has been developed. Increasing the feed rate caused the reduction in residence time. High screw speed resulted in short residence time, but large dispersion number. The non-flight element yielded the longest residence, but smallest dispersion number among three screw elements tested. A mathematical model consisting of a plug flow reactor in series with a continuous stirred tank reactor cross-flowing with a dead vol. fitted well the experimental data with correlation coeff. (r^2) higher than 0.988. The analysis showed that P (fraction of plug flow reactor) varied from 0.38 to 0.65. A high screw speed or fitting a mixing disc induced more mixing action, and thus a low value of P. The use of the model with literature data demonstrated that the model was applicable to food and non-food single-screw extrusion process. The applications of different models were also discussed. AA

616

Spiazzi (E) and Mascheroni (R). **Mass transfer model for osmotic dehydration of fruits and**

vegetables: 1. Development of the simulation model. *Journal of Food Engineering* 34(4); 1997; 387-410

A mathematical model based on mass transfer in plant tissues was developed with the aim of finding a smiple predictive model which was easy to use and yet had a broad application scope in the osmotic dehydration of foods. The model takes into account the capacity of each constituent to diffuse within tissue by using a diffusion coeff. and a transmembrane mass transfer coeff. The model also depends on the mass ratio of osmotic sol. to product, on the initial chemical composition of the product and sol. and on the product shape. The application of the model to apple dehydration with polyethyleneglycol (PEG) sol. allowed us to quantitatively simulate the time evolution of cellular and extracellular vol. which was observed previously in histological sections under the microscope. By using experimental data obtained during potato dehydration in mixed sol. of sucrose and salt, mass transfer and apparent diffusion coeff. were fitted in order to evaluate product behaviour under different process conditions. A good quantitative agreement was obtained between the experimental and calculated results. The model presented in this paper allows the main variables of osmotic dehydration to be estimated using a low number of fitting parameters, and interprets, through a simple algorithm, the complex phenomena of the main mass transfer mechanisms in plant tissues. AA

617

Vijayan (J) and Singh (RP). **Heat transfer during immersion frying of frozen foods.** *Journal of Food Engineering* 34(3); 1997; 293-314

A model was developed to predict heat transfer during frying of foods that are initially in a frozen state. The model involves two moving boundaries, one between frozen and unfrozen regions, and the other between the dry crust and the moist core region. Heat transfer within the crust region was predicted by Fourier's law, while heat transfer within the core region was formulated with the enthalpy method. Food composition and thermophysical properties were used to predict heat transfer within the food. The predicted results were experimentally validated. AA

618

Kedward (CJ), Macnaughtan (W), Blanshard (JMV) and Mitchell (JR). **Crystallization kinetics of lactose and sucrose based on isothermal differential scanning calorimetry.** *Journal of Food Science* 63(2); 1998; 192-197

Isothermal Differential Scanning Calorimetry (DSC) was used to study the crystallization kinetics of freeze-dried samples of lactose and sucrose at several temp. between Tg and Tm. The sample was rapidly heated to the required temp. After subtraction of an induction time, the Avrami equation was used to model the data and a Lauritzen-Hoffman like expression used to fit the derived rates of crystallization over the temp. range $Tg < T < Tm$. For both sugars the max. rate of crystallization occurred at a temp. slightly higher than the midpoint of Tg and Tm. Crystallization rates were higher for lactose than sucrose. This could be explained by simple changes in Tg and Tm which could be accounted for by differences in moisture content. AA

619

Fu (W-R), Sue (Y-C) and Chang (KLB). **Distribution of liquid-solid heat transfer coefficient among suspended particles in vertical holding tubes of an aseptic processing system.** *Journal of Food Science* 63(2); 1998; 189-191

Mass transfer coeff. between sucrose coated particles and water as the suspending fluid, were measured to obtain values of the heat transfer coeff. by analogy with mass transfer. In a vertical holding tube configuration, the mass transfer coeff. spanned considerable range for those particles with comparable residence time. At Reynolds number 26100, the av. mass transfer Sherwood number expressed in terms of residence time was $Sh = -110.4t + 215.1$, and it scattered normally with standard deviation 19.2. The results indicated that heat transfer coeff. vary among particles with different residence times and may be significantly different even for particles with the same residence time. AA

620

Kantt (CA), Schmidt (SJ), Sizer (CE), Palaniappan (S) and Litchfield (JB). **Temperature mapping of particles during aseptic processing with magnetic resonance imaging.** *Journal of Food Science* 63(2); 1998; 305-311

Magnetic Resonance Imaging (MRI) was used to obtain 2-dimensional temp. maps in potatoes undergoing aseptic processing. The change in precession frequency of protons served as the temp. indicator. The larger particles (6.9 and 3.84 cm^3) showed a ΔT ($T_{surface}$ - T_{center}) of up to 22 plus or minus 0.4°C 45 s after exiting the heat exchanger with the ΔT (T_{outlet} - T_{inlet}) of the carrier fluid in the heat exchanger at 30 to 45°C. No ΔT was measured between the center and the surface of particles < 2.05 cm^3 pumped at < 22.7 L/min. The av. fluid to particle convective heat transfer coeff. (h_{fp}) for the heat exchanger and holding tube was calculated using a finite element method. The hfp was from 600 to 2500 and > 3000 W/m^2 °C for the large (6.9 cm^3 cubes) and smaller particles resp. AA

Equipments

621

Awonorin (SO). **An appraisal of the freezing capabilities of tunnel and spiral belt freezers using liquid nitrogen sprays.** *Journal of Food Engineering* 34(2); 1997; 179-192

A parametric analysis, comparing the heat transfer and operating characteristics of a tunnel and a spiral belt freezer, has been carried out using liquid nitrogen sprays under typical commercial freezing conditions. Experimental data were obtained for a controlled spray pressure of 2.4 bar, and two selected pizza sizes (128 and 180 mm diam.) were used based on a freezing capacity of 500 pizzas per hour. The freezing time of the two pizza samples was between 4.1 and 4.4 min in the spiral belt and tunnel freezers, resp., and appeared to vary directly with sample mass. The av. heat transfer coeff. in the precooling section were 28 and 35 W m^{-2} K^{-1} in the tunnel and spiral belt freezers, resp. These values were about 1/6 and 1/5 of the overall heat transfer coeff. in the freezing section, and 1/16 and 1/15 of the av. heat transfer coeff. of individual droplets, resp., while maintaining freezer temp. between -140 and -150°C during freezing. Drip losses were low (0.55 to 0.6%) in the two freezers, and microbial destruction was in the order of six-fold. The mean sensory scores for textural feel of the frozen-thawed samples were not significantly different ($P > 0.05$), but panelists detected significant differences ($P < 0.05$) among samples on visual appearance. AA

622

Kondjoyan (A) and Boisson (HC). **Comparison of calculated and experimental heat transfer coefficients at the surface of circular cylinders placed in a turbulent cross-flow of air.** *Journal of Food Engineering* 34(2); 1997; 123-143

Heat transfer coeff. have been calculated using computational fluid dynamics (CFD) at the surface of an infinite circular cylinder (d = 0.1 m) subjected to a turbulent cross-flow of air whose velocity and turbulence intensities ranged from 0.5 to 5.0 $m.s^{-1}$ and from 1.5 to 40%, resp. The turbulence was accounted for by a k-ε model completed by near-wall treatment based either on a wall function or on Wolfshtein's low-Reynolds number model. Results confirm that the wall function approach leads to great differences between calculated and experimental mean transfer coeff. However, mean transfer coeff. are described efficiently by Wolfshtein's model providing that the variation of the damping of turbulent viscosity with the boundary sublayer thickness is considered. Finally this paper shows that the prediction of surface coeff. by CFD calculations alone has to be taken with caution. AA

FOOD CHEMISTRY AND ANALYSIS

Chemistry

623

Arvanitoyannis (I) and Biliaderis (CG). **Physical properties of polyol-plasticized edible films made from sodium caseinate and soluble starch blends.** *Food Chemistry* 62(3); 1998; 333-342

Aqueous blends of sodium caseinate and soluble starch, plasticized with polyols, were prepared by casting or by extrusion and hot pressing. The mechanical, thermal, gas and water permeation properties of these blends were studied after their conditioning at various RHs. With increasing plasticizer (water, polyols) content there was a progressive decrease of T_g of the blends. The plasticized blends also showed increased percentage elongation, whereas their flexural modulus and tensile strength exhibited a substantial drop. The gas permeability-temp. plots revealed

Arrhenius-type relationships with an inflection in the glass transition temp. region. AA

Chemistry (Analytical)

624

Simonne (AH), Simonne (EH), Eitenmiller (RR), Mills (HA) and Cresman (CP). **Could the Dumas method replace the Kjeldahl digestion for nitrogen and crude protein determination in foods?.** *Journal of the Science of Food and Agriculture* 73(1); 1997; 39-45

625

Chen (BH) and Huang (JH). **Degradation and isomerization of chlorophyll a and β-carotene as affected by various heating and illumination treatments.** *Food Chemistry* 62(3); 1998; 299-307

The degradation and isomerization of β-carotene and chlorophyll a as affected by oven-heating, reflux-heating, iodine-catalysed illumination, and non-iodine-catalysed illumination, were studied. Results showed that the degradations of both total β-carotene and chlorophyll a may fit the first-order model under either heating or illumination treatment. 13-cis-β-Carotene and 13,15-di-cis-β-carotene were the major cis isomers of β-carotene formed during oven heating, while 13-cis-β-carotene was favoured during reflux heating. For illumination with or without iodine as catalyst, 13,15-di-cis-β-carotene was the major cis isomer of β-carotene formed. The formation of 13,15-di-cis-β-carotene may be due to conversion of either 13-cis- or 15-cis-β-carotene. No epimerization of chlorophyll a was observed as a result of illumination. AA

626

Baek (HH) and Cadwallader (KR). **Roasted chicory aroma evaluation by gas chromatography/mass spectrometry/olfactometry.** *Journal of Food Science* 63(2); 1998; 234-237

Volatiles were isolated from roasted chicory by simultaneous steam distillation-solvent extraction (SDE) and dynamic headspace sampling (DHS). Many volatile components were identified in SDE (92) and DHS (64) extracts. Many pyrazines and N-furfurylpyrroles (N-furfurylpyrrole, N-furfuryl-2-formylpyrrole, and N-furfuryl-2-acetylpyrrole) were identified for the first time in roasted chicory. Aroma extract dilution analysis showed that those extracts from SDE and DHS were similar with respect to predominant aroma-active components. 2-Ethyl-3,5-dimethylpyrazine, 2,3-butanedione, 1-octen-3-one, 3-methylbutanal, and one unknown compound with a chicory- and burnt sugar-like note were the most intense aroma-active components found in roasted chicory. AA

627

Madson (MR) and Thompson (RD). **Determination of methylmercury in food commodities by gas-liquid chromatography with atomic emission detection.** *Journal of AOAC International* 81(4); 1998; 808-816

A method was developed for determining methyl-mercury in various food commodities. The organomercurial sp. was converted to methyl-mercuric chloride by treatment of a sample homogenized with 1.8M HCl. The resulting chlorinated sp. was eluted from a Celite 545-sample homogenate column with methylene chloride. The eluate was treated with stannic chloride, and the analyte was isolated from coextractives by using a wide-bore capillary column with microwave-induced plasma atomic emission detection. The method was applied to both high- and low-moisture commodities during analysis of 32 samples of grains, cereal products, fruits and vegetables. Methylmercury was found at trace levels (i.e., between a signal-to-noise ratio of 3:1 and 10:1) and up to 0.85 ppb. Recoveries of added methylmercury ranged from 70.0 to 114.0%. Limits of quantitation and detection were 0.63 and 0.24 pg on column, resp., corresponding to 0.30 and 0.11 ng Hg/g sample for a 40 g sample treated according to the method. AA

628

Yu (F-Y) and Chu (FS). **Analysis of fumonisins and *Alternaria alternata* toxin by liquid chromatography-enzyme-linked immunosorbent assay.** *Journal of AOAC International* 81(4); 1998; 749-756

Use of a direct competitive ELISA as a postcolumn monitoring system after liquid chromatography (LC) is described for analysis of different fumonisin analogs. Without cleanup and derivatization, sample extracts are directly injected into a C_{18} reversed-phase column and then subjected to LC. Fractions (0.5 mL each) are collected and then analyzed by ELISA. LC using a water-methanol gradient separated the 3 major fumonisins FmB1,

FmB2, and FmB3, and as low as 0.1 ng FmB1 could be detected. Recovery of FmB1 added to ground corn (100-1000 ng/g) and then extracted with CH_3CN-H_2O (1 + 1, v/v) was 78.8%. Analysis of fumonisins in one starch and 14 naturally contaminated corn samples showed that FmB1 was the major fumonisin. Ten samples also were contaminated with FmB2, but only 2 samples were contaminated with FmB3. The method also was used to analyze extracts from cultures of 3 *Alternaria alternata* (AAL) strains. Both FmB1 and the AAL toxin TA were detected in the culture extracts, and their amounts varied considerably with the cultures tested. AA

FOOD MICROBIOLOGY AND HYGIENE

Microorganisms

629

Binita Rani and Neelam Khetarpaul. **Probiotic fermentation of indigenously developed RSMT mixture: Effect on antinutrients and digestibility of starch and proteins.** *Journal of Food Science and Technology (India)* 36(1); 1999; 71-73

An indigenous nutritious food mixture i.e., RSMT containing rice, defatted soy flour, skimmed milk powder and tomato pulp in 2:1:1:1 proportion (w/w) was developed. For carrying out probiotic fermentation, the developed food mixture was mixed with water, autoclaved, cooled, inoculated with *L. acidophilus* (10^5 cells/ml) and fermented at 37°C for 24 h. A significant ($P < 0.05$) reduction in the contents of phytic acid and polyphenols was noticed due to the cumulative effect of autoclaving and fermentation to the extent of 63 and 19% resp. Starch digestibility (*in vitro*) in the fermented food mixture was doubled, while 51% enhancement was noticed in the protein digestibility of the fermented product over the control. A significant ($P < 0.01$) negative correlation was obtained between the contents of antinutrients and digestibility. AA

630

Lucht (L), Blank (G) and Borsa (J). **Recovery of foodborne microorganisms from potentially lethal radiation damage.** *Journal of Food Protection* 61(5); 1998; 586-590

A two-stage recovery protocol was examined for microorganisms following γ-irradiation in phosphate buffer at 0°C. In the first stage, survivors were recovered on basal yeast extract agar and held at various temp. suboptimal for their growth for 20 h (resuscitation protocol). In the second stage the survivors were incubated for an additional 24 h, but in this case at their optimum temp. for growth. Controls consisted of survivors which were not subjected to the resuscitation protocol (direct incubation at their optimum growth temp.). The ratio of survivors enumerated with and without the resuscitation protocol (control) at each specified temp. was used to formulate a recovery factor (RF). An RF was determined for each treatment dose. Results of this study indicated that the number of *Escherichia coli*, *Salmonella* serotype *typhimurium* and *Brochothrix thermosphacta* survivors increased following a resuscitation protocol ($RF > 2.0$). Overall, optimum resuscitation temp. ranged from 14 to 22°C. The extent of recovery also appeared dose dependent, with larger treatment doses giving rise to a higher RF. *Salmonella* serotype *typhimurium* irradiated at 1.5 kGy exhibited the highest RF, 161, when resuscitated at 22°C. *Listeria monocytogenes*, *Yersinia enterocolitica*, *Staphylococcus aureus*, *Aeromonas hydrophila* and *Saccharomyces cerevisiae* exhibited an $RF < 2.0$ regardless of resuscitation temp. Results of this study indicated that the use of suboptimal holding temp. as part of a recovery protocol may have advantages, especially with respect to the enumeration of *E. coli* and salmonellae survivors in irradiated foods such as poultry. AA

631

Kozempel (MF), Annous (BA), Cook (RD), Scullen (OJ) and Whiting (RC). **Inactivation of microorganisms with microwaves at reduced temperature.** *Journal of Food Protection* 61(5); 1998; 582-585

A pilot-plant nonthermal flow process using microwave energy to inactivate microorganism was developed. The process consists of multiple passes through the microwave generator. Each passed material goes to receiving tank for subsequent passes. The flow rate was 0.96 to 1.26 kg/min and the dwell time per pass was 1.1 to 1.5 min. Five passes were used. The microwave energy is instantaneously and simultaneously applied to the system, and thermal energy is removed by a cooling tube within the process line in the microwave generator. The cooling tube maintains the temp.

below 40°C. There was significant reduction in microorganisms in water, 10% glucose sol., and apple juice, and in yeast in beer. There was a slight decrease in microorganisms in tomato juice, pineapple juice, apple cider, and beer; and no effect in skim milk. AA

632

Dahms (S) and Hildebrandt (G). **Some remarks on the design of three-class sampling plans.** *Journal of Food Protection* 61(6); 1998;757-761

Among the var. of sampling plans for the evaluation of bacterial counts the attributive three-class sampling plan has widely gained acceptance because of its simple application and its robust functionality. However, the performance characteristics of three-class sampling plans depend on lot heterogeneity and the distance between the microbiological limits m and M, which are the max. level of target organisms under conditions of good manufacturing practice (GMP) and the level of target organisms that is considered as unacceptable or defective. The probability of lot rejection due to a single sample result above M increases with increasing lot heterogeneity and/or with decreasing distance between these limits. Especially for investigations on nonpathogenic microorganisms it is questionable whether a lot still meeting GMP conditions should be rejected solely because a single sample result lies above M. Taking the often used three-class sampling plan (n = 5; c_m = 2, c_M = 0) as an example, it is demonstrated how insight into the relationship between sample variability and an appropriate distance between m and M can be gained. These calculations are based on the assumptions that logarithmically transformed bacterial counts follow a normal distribution and that an indifference lot with a contamination level at m is to be evaluated. For this kind of lot the probability of acceptance or rejection is equally 0.5 according to the two-class sampling plan. Introducing a limit for the additional risk of rejection of an indifference lot with acceptable heterogeneity when the three-class sampling plan is applied, a criterion for choosing the distance between m and M is developed. AA

Bacteria

633

Townsend (DE) and Naqui (A). **Comparison of SimPlate™ total plate count test with plate count agar method for detection and quantitation of bacteria in food.** *Journal of AOAC International* 81(3); 1998; 563-569

The SimPlate™ total plate count (TPC) test, developed by IDEXX laboratories, Inc., detects and quantitates total bacterial concn. in food after 24 h of incubation. The performance of SimPlate TPC was compared with that of the plate count agar (PCA) method for enumerating total bacterial concn. of 255 food samples representing 15 different food matrixes. Total bacterial counts on SimPlate TPC were measured after 24 h of incubation and plotted against values obtained from PCA after 48 h. Simple regression analysis of the data showed strong correlation between the methods (r = 0.95); the sensitivity of SimPlate TPC for foodborne bacteria was 96% relative to PCA (slope = 0.96). It was concluded that SimPlate TPC is a suitable alternative for the detection and quantitation of foodborne bacteria. The method has been granted Performance Tested Certification by the AOAC Research Institute. AA

634

Rodrigo (F), Gasque (F), Fiszman (SM) and Martinez (A). **Effect of lyophilization on the mechanical characteristics of a large particle and on the behaviour of immobilized bacterial spores.** *Journal of Food Protection* 61(5); 1998; 633-636

The mechanical stability of the carrier and the behaviour of the sensor element of a time-temp. integrator (TTI) after lyophilization and storage for 60 days at room temp. were studied. The results indicated that particles containing added starch at concn. from 2 to 12% had good handling characteristics for use as TTI carriers, although mechanical resistance was lower by comparison with freshly prepared particles. Lyophilization reduced the number of viable microorganisms by 17 to 25%, depending on the length of the storage period. Variations were also observed in the count of surviving microorganisms after heating at 121°C for 12 min. These variations, expressed as decimal reductions in the number of microorganisms, might reflect an effect of lyophilization on the thermal resistance of the immobilized spores. AA

635

Annous (BA) and Kozempel (MF). **Influence of growth medium on thermal resistance of *Pediococcus* sp. NRRL B-2354 (formerly**

***Micrococcus freudenreichii*) in liquid foods.** *Journal of Food Protection* 61(5); 1998; 578-581

Pediococcus sp. is a nonpathogenic heat-resistant spoilage organism that has been used as a test organism in milk pasteurization studies. These characteristics make this bacterium an attractive test organism to study the mode of bacterial thermal inactivation in a food pilot plant. The effect of growth medium on the thermal D value of this organism in skim milk, whole liquid egg, 10% glucose sol., pineapple juice, apple juice, tomato juice, and water at 60°C are reported. Thermal inactivation was done in a submerged coil; D values were calculated from the linear portion of the survival curves by linear regression analysis. The range of D values of stationary-phase cells grown at 28°C in tryptone glucose yeast extract (TGY) or tryptic soy broth (TSB) was 0.14 to 12.05 min in all heating menstrua tested. The TSB-grown cells exhibited the highest thermal resistance with skim milk and 10% glucose sol. as the heating menstrua. Survival curves of the TGY-grown cells indicated the presence of a cell population heterogeneous in thermal resistance. The TSB-grown cells exhibited a cell population uniform in thermal resistance and with a lag time for thermal inactivation. When compared to TGY-grown cells, *Pediococcus* sp. grown in TSB showed a significant ($P < 0.05$) increase in D values by up to eightfold in all heating menstrua. Results from this study suggested that thermal inactivation of *Pediococcus* sp. was dependent on the growth medium and on the heating menstruum with respect to both pH and composition. AA

Bacillus cereus

636

Mazas (M), Lopez (M), Gonzalez (I), Gonzalez (J); Bernardo (A), Martin (R). **Effects of the heating medium pH on heat resistance of *Bacillus cereus* spores.** *Journal of Food Safety* 18(1); 1998; 25-36

The influence of the pH of the heating medium (which included several foods and buffers) on the thermal resistance (D and z-values) of spores of three *Bacillus cereus* strains was studied. Acidification from pH 7.0 to 4.0 produced a 5-fold decrease in D-values. Plots of log D vs. pH gave straight lines, which made it possible to develop an equation to approx. predict the changes in heat sensitivity of *B. cereus* spores which occurred with changing pH. z-Values for two of the strains studied were not affected by acidification. On the other hand, with the strain ATCC 9818, a clear and statistically significant increase in z-value was observed as the pH decreased. AA

637

Jaquette (CB) and Beuchat (LR). **Combined effects of pH, nisin and temperature on growth and survival of psychrotrophic *Bacillus cereus*.** *Journal of Food Protection* 61(5); 1998; 563-570

Growth of vegetative cells and outgrowth of spores of enterotoxigenic psychrotrophic *Bacillus cereus* in refrigerated minimally processed food products is a public health concern. A study was undertaken to determine the combined effects of pH, nisin and temp. on growth and survival of 20 strains of *B. cereus*. The min. growth temp. in tryptic soy broth (pH 7.3) and brain heart infusion broth (BHI broth, pH 7.4) were 5°C for two strains and 8°C for five other strains. Vegetative cells of 4 of 8 strains grew at 8°C in BHI broth (pH 6.01 and 6.57) containing 10 μg of nisin per ml. At 15°C, all strains grew at pH 5.53 to 6.57; 3 strains tolerated nisin at 50 μg/ml (pH 6.57), whereas 2 other strains had a max. tolerance of 10 μg of nisin per ml. Tolerance of vegetative cells of *B. cereus* to nisin increased as the pH of the broth was increased from 5.53 to 6.01 and again to pH 6.57. Outgrowth of spores (six of six strains tested) was inhibited by 5 and 50 μg of nisin per ml at 8 and 15°C, resp. At 15°C, outgrowth of spores of two strains occurred at pH 6.52 in BHI broth containing 10 μg of nisin per ml. The effectiveness of nisin in controlling the growth of psychrotrophic strains of *B. cereus* capable of causing human illness was more pronounced at 8°C than at 15°C and as the pH was decreased from 6.57 to 5.53. Studies to determine the effectiveness of nisin in controlling growth of psychrotrophic *B. cereus* in nonpasteurized foods held at refrigeration temp. are warranted. AA

Escherichia coli

638

Byun (M-W), Kwon (O-J), Yook (H-S) and Kim (K-S). **γ-irradiation and ozone treatment for inactivation of *Escherichia coli* O157:H7 in culture media.** *Journal of Food Protection* 61(6); 1998; 728-730

A study was conducted to investigate the reduction and elimination of *Escherichia coli* O157:H7 by the effects of γ-irradiation and ozone treatment. Log phase cells were found to be more sensitive to γ-irradiation than stationary phase cells. *E. coli*

O157:H7 was found to be considerably more resistant to irradiation at -18°C than at 20°C. The D values for this organism for treatment with ozone in tryptic soy agar were higher than those for treatment with ozone in phosphate buffer. γ-Irradiation at a dose of 1.5 kGy or ozone treatment at a concn. of 3 to 18 ppm for 20 to 50 min was required to assure the elimination of *E. coli* O157:H7. AA

639

Brudzinski (L) and Harrison (MA). **Influence of incubation conditions on survival and acid tolerance response of *Escherichia coli* O157:H7 and non-O157:H7 isolates exposed to acetic acid.** *Journal of Food Protection* 61(5); 1998; 542-546

The increasing frequency of *Escherichia coli* O157:H7 outbreaks, especially in acidic foods, raises the concern of an acid tolerance response (ATR). Organic acids can be present in processed and preserved foods: shifts in the acid levels of foods due to these acids may allow *E. coli* to adapt and later tolerate pH levels that would normally inactivate the organism. The effect of temp. and agitation on the ATRs of three *E. coli* O157:H7 and two non-O157:H7 isolates were determined. Triggered at pH 5.0, the adaptive system of the ATR allowed for up to nearly 1,000-fold enhanced survival of *E. coli* O157:H7 cells in some cases compared to survival of nonadapted cells at pH 4.0 *E. coli* O157:H7 isolates revealed greater acid tolerance responses when incubated statically at 32°C, whereas the non-O157:H7 *E. coli* isolates exhibited a greater acid tolerance response with orbital agitation at 25°C. The magnitude of response changed over the incubation period. AA

Lactobacillus

640

Ambrosini (VMD), Gonzalez (S), Holgado (APDR) and Oliver (G). **Study of the morphology of the cell walls of some strains of lactic acid bacteria and related species.** *Journal of Food Protection* 61(5); 1998; 557-562

Listeria monocytogenes

641

Juneja (VK), Foglia (TA) and Marmer (BS). **Heat resistance and fatty acid composition of *Listeria monocytogenes*: Effect of pH, acidulant, and growth temperature.** *Journal of Food Protection* 61(6); 1998; 683-687

This study determines the influence of pH, acidulant, and growth temp. history on the heat resistance and fatty acid composition of *Listeria monocytogenes* Scott A. Cells were grown to late exponential phase (OD_{600} = 0.6) at 10, 19, or 37°C in brain heart infusion broth acidified to pH 5.4 or 7 with either acetic or lactic acid. Thermal death times at 60°C subsequently were determined by using a submerged-coil heating apparatus. The surviving cell population was enumerated by spiral-plating heated samples onto tryptic soy agar supplemented with 0.6% yeast extract and 1% sodium pyruvate. The thermal resistance of cells cultured at a particular temp. was significantly lower ($P < 0.05$) when lactic acid was used to acidify the medium to pH 5.4. Regardless of acid identity, D values significantly decreased ($P < 0.05$) with increased growth temp. when the pH of the growth medium was 5.4, whereas D values significantly increased ($P < 0.05$) with increased temp. at pH 7. At pH 5.4 adjusted with lactic acid, D values were 1.30, 1.22 and 1.14 min for cells grown at 10, 19 and 37°C, resp. At pH 5.4 adjusted with acetic acid, *E. monocytogenes* failed to grow at 10°C; the D values were 1.32 and 1.22 min when the cells were grown at 19 and 37°C, resp. At pH 7, the D values were 0.95, 1.12, and 1.28 min with lactic acid and 0.83, 0.93 and 1.11 min with acetic acid at 10, 19 and 37°C, resp. The most abundant fatty acids (44 to 82%) were branched-chain saturated fatty acids (anteiso- and iso-C15:0 and iso-C17:0) regardless of pH, acidulant, or growth temp. However, there was an increase in C15:0 isomers at the expense of iso-C17:0 when the growth temp. was lowered from 37 to 10°C. While variable changes in longer-chain fatty acids were found, the percentage of longer-chain (C16 and C18) fatty acids was greatest when *L. monocytogenes* was grown at 37°C regardless of pH or acidualnt. Study demonstrates that the heat resistance of *L. monocytogenes* depends upon its growth conditions.

642

Arizcun (C), Vasseur (C) and Labadie (JC). **Effect of several decontamination procedures on *Listeria monocytogenes* growing in biofilms.** *Journal of Food Protection* 61(6); 1998; 731-734

Listeria monocytogenes is a pathogenic bacterium which has been implicated in several foodborne

illnesses. This microorganism grows into biofilms attached to the surfaces in food-processing plants, increasing its resistance to antimicrobial agents. The present work was realized to investigate the attachment of *L. monocytogenes* isolates to glass surfaces and to find a decontamination procedure to remove these bacteria in biofilms. Three-day biofilms were prepared by growing *L. monocytogenes* isolates from food plant environments on glass surfaces. Sixteen decontamination treatments at different pHs, temp. and times of exposure were tested against *L. monocytogenes* biofilms. The most efficient treatments were those applied at 63°C. Combinations of decontamination treatments applied at 55°C for 30 min provided different results according to the other factors used. In general, *L. monocytogenes* biofilms were found to be not very susceptible to high osmolarity (10.5% NaCl), and the interaction of NaCl and acid did not seem to have important effects in inactivating these bacteria (from a 1.3- to a 1.9-log-cfu/cm^2 reduction). The combination of NaOH (pH 10.5; 100 mM) and acetic acid (pH 5.4; 76.7 mM) applied sequentially at 55°C for even 5 min was shown to be the most effective treatment to remove *L. monocytogenes* from biofilms (at least a 4.5- to 5.0-log-cfu/cm^2 decline). AA

643

Roering (AM), Wierzba (RK), Ihnot (AM) and Luchansky (JB). **Pasteurization of vacuum-sealed packages of summer sausage inoculated with *Listeria monocytogenes*.** *Journal of Food Safety* 18(1); 1998; 49-56

Packages containing chubs of summer sausage were inoculated with about 10^8 cfu/mL of a three-strain mixture of *Listeria monocytogenes* and vacuum sealed. The fate of the pathogen was then monitored after pasteurization at 150 F (66°C), 170 F (77°C), 190 F (88°C) and 210 F (99°C) for 0 to 240 s. Pathogen numbers were reduced by about 3 $\log_{10}$ cfu/g within 30, 60, or 90 s at 210 F (99°C), 190 F (88°C), or 170 F (77°C), resp., whereas numbers were reduced by < 2.0 $\log_{10}$ cfu/g after 240 s of heating at 150 F (66°C). The calculated D values were 2.08 min at 150 F (66°C), 0.84 min at 170 F (77°C), 0.37 min at 190 F (88°C), and 0.28 min at 210 F (99°C). These results establish the feasibility of using pasteurization to control *L. monocytogenes* in packaged summer sausage. AA

644

Stewart (D) and Gendel (SM). **Specificity of the BAX polymerase chain reaction system for detection of the foodborne pathogen *Listeria monocytogenes*.** *Journal of AOAC International* 81(4); 1998; 817-822

The polymerase chain reaction (PCR) can be used for rapid and specific detection of foodborne pathogens. One commercial kit, the Qualicon BAX system uses PCR to detect *Listeria monocytogenes* in enrichment cultures derived from food and environmental samples. The specificity and sensitivity of the BAX system for detecting *L. monocytogenes* were characterized by using both pure and mixed cell cultures, and optimal conditions for production of cell lysates were determined. The BAX system was highly specific for *L. monocytogenes*, and no interference was seen in the presence of either other *Listeria* sp. or microbes from other genera. The assay detected *L. monocytogenes* at 10^5-10^6 cfu/mL. This sensitivity is adequate for detecting viable cells after enrichment but prevents false-positive signals from noviable cells. AA

645

Buchanan (RL) and Golden (MH). **Interactions between pH and malic acid concentration on the inactivation of *Listeria monocytogenes*.** *Journal of Food Safety* 18(1); 1998; 37-48

The effects and interactions of malic acid (MA) concn. and pH on the inactivation kinetics of a 3 strain mixture of *Listeria monocytogenes* was studied in brainheart infusion (BHI) broth. The medium was supplemented with MA and monosodium malate to achieve pH levels of 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5 or 7, stored aerobically at 28°C, and assayed periodically for viable counts by plating on BHI agar. Inactivation rates were dependent on both the pH and MA concn. At the higher pH levels, MA appeared to provide some degree of protection compared to control cultures where the pH was adjusted with HCl. The results indicate that MA is a relatively benign organic acid. Its antimicrobial characteristics are similar to those of citric acid and is substantially less bactericidal than lactic or acetic acids. SRA

Salmonella

646
Shelef (LA) and Tan (W). **Automated detection of hydrogen sulphide release from thiosulphate by *Salmonella* spp.** *Journal of Food Protection* 61(5); 1998; 620-622

Hydrogen sulphide production is used in conventional tests for identification and differentiation of *Salmonella* spp. from other sp. of *Enterobacteriaceae*, and a black precipitate on agar media is the indicator of the reaction. Selective liquid media were formulated for automated optical detection of H_2S in salmonellae using the BioSys instrument. The media contained thiosulphate and ferric ammonium citrate, and production of H_2S caused copious black pigmentation of the broth. Combination of the H_2S indicators with dulcitol or xylose as fermentable carbohydrate, lysine, ornithine or arginine to induce decarboxylase activity, and Tergitol 4 as inhibitor selectively identified six *Salmonella* spp. by a sharp drop in transmittance at 585 nm. The time for detection of transmittance changes was inversely proportional to initial numbers of cfu in the media: 10 h for 10^5 cfu/ml and 17 h for 10^1 cfu/ml. No detection was observed in six non-*Salmonella* sp. of *Enterobacteriaceae* tested. AA

Fungi

Mushrooms

647
Ereifej (KL) and Al-Raddad (A). **Identification and quality evaluation of two wild mushrooms in relation to *Agaricus bisporus* from Jordan.** *Journal of Food Science and Technology (India)* 36(1); 1999; 81-83

Two wild mushrooms (*Boletus erythropus* and *Entoloma clypeatum*) were collected and a farm mushroom (*Agaricus bisporus*) was bought from a local market. The three mushrooms were evaluated for their physical properties, chemical and mineral composition. The wild mushrooms were identified as *Boletus erythropus* and *Entoloma clypeatum*. Results showed that the wild mushrooms were edible and varied significantly ($P < 0.05$) in their physical properties, chemical and mineral composition. *Entoloma* sp. had low protein content, but had the highest in fat and energy values, *Boletus* sp. was found to have higher content of fibre and carbohydrates, *Agaricus* sp. had the highest protein content (4.04%) and the lowest calorie value (26.38 Kcal/100 g). *Boletus* sp. was the largest in cap diam. (13.6 cm). Although all the mushrooms varied in mineral contents, these were good sources of Ca, K, Mg, Fe, Zn and P. AA

648
Cheung (PC-K). **Dietary fibre content and composition of some edible fungi determined by two methods of analysis.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 255-260

Six common edible fungi *Agaricus bisporus* (Agaricales), *Auricularia auricula* and *Auricularia polytricha* (Auriculariales), *Tremella fuciformis* (Tremellates), *Ganoderma lucidum* and *Poria cocos* (Aphyllophorales), were analysed for their total dietary fibre (TDF) content using the AOAC method and for dietary fibre (DF) content and composition using the Uppsala method (UM). The nonprotein nitrogen contributed from fungal chitin was corrected in the fibre residue obtained by the AOAC method. The TDF content measured by the AOAC method was always greater than that of the UM. The TDF content determined by the AOAC and UM ranged from 182 and 132 g kg^{-1} (dietary matter (DM)) in *A. bisporus* to 735 and 711 g kg^{-1} (DM) in *P. cocos*, resp. Neutral and amino sugars were the dominant sugars in all the fungi. Sugar composition of the TDF reflected that the major cell wall polysaccharides in most fungi were hemicelluloses, such as β-glucan and glucuronoxylomannan, pectic substances and chitin. Judging from their high fibre content and unique fibre composition, edible fungi have considerable value as sources of dietary fibre in human nutrition. AA

Rhodotorula gracilis

649
Somashekar (D) and Joseph (R). **Antagonism of Zygomycetes fungi by *Rhodotorula gracilis* CFR-1.** *Journal of Food Science and Technology (India)* 36(1); 1999; 52-54

An isolate of *Rhodotorula gracilis* CFR-1 was tested for its inhibitory activity against several Zygomycetes cultures by plate diffusion assay method. Most distinct inhibition was observed for *Mucor heimalis*, *M. jansseni* and *Cunninghamella verticellata*. The role of a chitosan hydrolysing enzyme secreted by

Rhodotorula gracilis in the antagonism against the Zygomycetes fungi was also studied. AA

Yeast

Brewer's Yeast

650

Pacheco (MTB) and Sgarbieri (VC). **Hydrophilic and rheological properties of brewer's yeast protein concentrates.** *Journal of Food Science* 63(2); 1998; 238-243

Protein solubility (PS), water-holding capacity (WHC), viscosity and gelling properties were studied in brewer's yeast protein conc. prepared by 3 procedures: isoelectric precipitation of protein (I-PC), extraction with 0.5 M $NaClO_4$ (P-PC) or with 3% sodium trimetaphosphate (TMP-PC). PS was higher for TMP-PC and lower for P-PC at pH 4 to 12. WHC increased with increasing pH in all conc., but was higher for TMP-PC. The presence of NaCl (0.1 M and 1.0 M) reduced to 50% the WHC of TMP-PC. Gelling properties of a 10% protein dispersion were studied in the TMP-PC preparation. Hardness and fracturability of the gel (TA-XT2 texturometer) was 35 and 31 gf, resp. Apparent viscosity of a 3% dispersion at pH 7.0 was lower for I-PC and higher but similar for TMP-PC and P-PC. All conc. showed pseudoplastic rheological behaviour. AA

Hygiene

651

Vose (DJ). **The application of quantitative risk assessment to microbial food safety.** *Journal of Food Protection* 61(5); 1998; 640-648

Quantitative risk assessment (QRA) is rapidly accumulating recognition as the most practical method for assessing the risks associated with microbial contamination of foodstuffs. These risk analyses are most commonly developed in commercial computer spreadsheet applications, combined with Monte Carlo simulation add-ins that enable probability distributions to be inserted into a spreadsheet. If a suitable model structure can be defined and all of the variables within that model reasonably quantified, a QRA will demonstrate the sensitivity of the severity of the risk to each stage in the risk-assessment model. It can therefore provide guidance for the selection of appropriate risk-reduction measures and a quantitative assessment of the benefits and costs of these proposed measures. However, very few reports explaining QRA models have been submitted for publication in this area. There is, therefore, little guidance available to those who intend to embark on a full microbial QRA. This paper looks at a number of modelling techniques that can help produce more realistic and accurate Monte Carlo simulation models. The use and limitations of several distributions important to microbial risk assessment are explained. Some simple techniques specific to Monte Carlo simulation modelling of microbial risks using spreadsheets are also offered which will help the analyst more realistically reflect the uncertain nature of the scenarios being modelled, simulation, food safety. AA

FOOD ADDITIVES

Stabilizers

Gums

652

Xu (W), Nikolov (A), Wasan (DT), Gonsalves (A) and Borwankar (RP). **Fat particle structure and stability of food emulsions.** *Journal of Food Science* 63(2); 1998; 183-188

The effects of protein submicelles, temp., gum (xanthan) and shear rate on the fat particle structuring and the stability of food emulsions were investigated. A nondestructive kossel diffraction technique based on the principle of backlight scattering to characterize the structure formation in CMC model food emulsions was used. Caseinate stabilized food emulsions by the formation of a caseinate adsorbed layer and by caseinate submicelle microlayering around the fat particles. Xanthan made the fat particle structure inside food emulsions less ordered, therefore it exerted an adverse effect on emulsion stability. Increasing shear rate decreased the fat particle. BV

CEREALS

653

Obétta (SE) and Onwualu (AP). **Effect of different surfaces and moisture contents on angle of**

friction of foodgrains. *Journal of Food Science and Technology (India)* 36(1); 1999; 58-60

Effects of various material surfaces and different moisture content levels on the angle of friction of maize and rice were investigated. Moisture content and test surfaces were found to have affected the angle of friction very significantly (P = 0.01). For moisture content only, linear regression equations were fitted and their correlation coeff. ranged from 0.99 to 0.997 for the two crops. AA

Rye

654

Nilsson (M), Aman (P), Harkonen (H), Hallmans (G), Knudsen (KEB), Mazur (W), Adlercreutz (H). **Content of nutrients and lignans in roller milled fractions of rye.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 143-148

Rye grain was roller milled into 6 flour fractions (607 g kg^{-1}), a short (341 g kg^{-1}) and a bran (52 g kg^{-1}) in a Buhler laboratory mill. In the different flour (F1-F6) a progressive increase in ash (4-13 g kg^{-1}), crude protein (39-87 g kg^{-1}, CP) and crude fat (5-17 g kg^{-1}, CF) concn. was found and a corresponding decrease in starch (853-699 g kg^{-1}) concn. Total dietary fibre (TDF) (55-109 g kg^{-1}) constituents and the lignans, matairesinol (0.05-0.22 mg kg^{-1}) and secoisolariciresinol (0.21-0.38 mg kg^{-1}), showed a different distribution with a maximal concn. in F5. The short and bran had higher concn. of ash, CP, CF, dietary fibre components and lignans but a lower concn. of starch than the flours. Compared to the short, the bran contained more of all constituents analysed except mixed-linked β-glucan and starch. A very high proportion of TDF components of the rye, such as arabinoxylan (72%), cellulose (76%) and Klason lignin (79%) as well as of matairesinol (87%) and secoisolariciresinol (73%), was found in the short and bran together. AA

Wheat

655

Walker (F) and Meier (B). **Determination of the *Fusarium* mycotoxins nivalenol, deoxynivalenol, 3-acetyldeoxynivalenol, and 15-O-acetyl-4-deoxynivalenol in contaminated whole wheat flour by liquid chromatography with diode array detection and gas chromatography with electron capture detection.** *Journal of AOAC International* 81(4); 1998; 741-748

A rapid and sensitive method was developed for simultaneous detection of nivalenol (NIV), deoxynivalenol (DON), 3-acetyldeoxynivalenol (3-A-DON) and 15-O-acetyl-4-deoxynivalenol (15-A-DON) in wheat flour. Samples were extracted with acetonitrile-water (84+16), and the extract was filtered and purified by a column containing a combination of charcoal, celite, and other adsorbents. For screening analysis, the column eluate was only extracted with ethyl acetate. After evaporation of the solvent, the dried residue was redissolved in acetonitrile-water (2 + 8) and then analyzed by reversed-phase liquid chromatography (LC) with diode array detection. Recoveries of NIV, DON, 3-A-DON, and 15-A-DON from whole wheat flour spiked at 2 levels were 49-55, 92-97, 98-100 and 100-105%, resp. To quantitate mycotoxin amounts lower than 1 ppm, purified column extracts were evaporated to dryness, derivatized with heptafluorobutyric anhydride, and analyzed by GC with electron capture detection (GC-ECD). Av. recoveries of NIV, DON, 3-A-DON, and 15-A-DON from whole wheat flour spiked at 2 levels, were 45-52, 91-103, 81-85, and 84-92%, resp. GC-ECD detection limits for all mycotoxins tested at a signal-to-noise ratio of 4:1 were < 30 ng/g. Results of GC-ECD analysis for whole wheat flour samples spiked with mycotoxins at 3 and 10 ppm compared well with results (2.8 and 9.9 ppm) for the same samples analyzed by LC. AA

656

Anon. **Determination of deoxynivalenol in white flour, whole wheat flour, and bran by solid-phase extraction/ liquid chromatography: Interlaboratory study.** *Journal of AOAC International* 81(4); 1998; 880-886

MILLETS

Corn

657

Montes-Belmont (R) and Carvajal (M). **Control of *Aspergillus flavus* in maize with plant essential oils and their components.** *Journal of Food Protection* 61(5); 1998; 616-619

The effects of 11 plant essential oils for maize kernel protection against *Aspergillus flavus* were studied. Tests were conducted to determine optimal levels of dosages for maize protection, effects of combinations of essential oils, and residual effects and toxicity of essential oils to maize plants. Principal constituents of eight essential oils were tested for ability to protect maize kernels. Essential oils of *Cinnamomum zeylanicum* (cinnamon), *Mentha piperita* (peppermint), *Ocimum basilicum* (basil), *Origanum vulgare* (origanum), *Teloxys ambrosioides* (the flavouring herb epazote), *Syzygium aromaticum* (clove), and *Thymus vulgaris* (thyme) caused a total inhibition of fungal development on maize kernels. Thymol and o-methoxycinnamaldehyde significantly reduced maize grain contamination. The optimal dosage for protection of maize varied from 3 to 8%. Combinations of *C. zeylanicum* with the remaining oils gave efficient control. A residual effect of *C. zeylanicum* was detected after 4 wks. of kernel treatment. No phytotoxic effect on germination and corn growth was detected with any of these oils. AA

658

Arambula (VG), Figueroa (JDC), Martinez-Bustos (F), Ordorica (FCA) and Gonzalez-Hernandez (J). **Milling and processing parameters for corn tortillas from extruded instant dry masa flour.** *Journal of Food Science* 63(2); 1998; 338-341

A continuous extrusion process to provide instant corn flour for tortillas was evaluated. Variables investigated included two types of mill (knives and hammer) with screens with two diam. (0.5 and 0.8 mm), two types of corn (hard endosperm or normal and soft endosperm or cacahuazintle), lime concn. (0.15 and 0.25% w/w), processing moisture (45 and 48% w/w) and temp. (70, 80 and 90°C). The water absorption capacity, water solubility index, colour of instant corn flour, adhesiveness of masa, tensile strength, cutting force, rollability and puffing of tortillas, were compared. Based on textural data the hammer mill with 0.8 mm sieve, normal corn type, 0.15% lime, 48% moisture and 90°C processing temp., produced the highest quality tortillas. AA

659

Tan (J), Zhang (H) and Gao (X). **SEM image processing for food structure analysis.** *Journal of Texture Studies* 28(6); 1997; 657-672

Image processing techniques were developed to characterize the cellular structure of puffed corn meal extrudates from their scanning electron microscope (SEM) images. Cross-section SEM images were taken and digitized for product-samples of different degrees of expansion. Two major approaches were developed to extract structure-related image features. The air cells were also manually measured as the true characteristics of the cellular structure. Correlation and regression analyses were conducted to determine the effectiveness of the image features as measures of the structural characteristics. A number of image features were found to be good indicators of cell size and cell uniformity (R^2-values up to 0.95). The image processing techniques developed were useful in cellular structure characterization and they provide a rapid and consistent way for food cellular structure quantification and analysis. AA

660

Vasanthi (S), Bhat (RV) and Subbulakshmi (G). **Aflatoxin intake from maize-based diets in a rural population in Southern India.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 226-230

The aflatoxin intake (AI) through the consumption of maize was assessed in 12 households in a rural population in Southern India. This was based on the measurement of aflatoxin levels in cooked maize and the quantity of consumption of the maize. The av. AI in nine out of 12 household ranged from 0.33 to 1.5 μg day^{-1}. Individual intakes varied from 0.08 to 2.22 μg day^{-1}. When assessed on a body wt. basis, AI in the younger age groups were observed to be higher. The av. intakes in different age groups 1-5, 5-12, 12-18 and above 18 yrs. were observed to be 47, 35, 33 and 22 ng kg^{-1} body wt. day^{-1}, resp. AI calculated from aflatoxin levels in maize before cooking tended to be higher by 36% when compared with intakes calculated from cooked maize. This significant difference ($P < 0.001$) was attributed to the effect of cooking on aflatoxin levels in maize. AA

661

Haros (M) and Suarez (C). **Effect of drying, initial moisture and variety in corn wet milling.** *Journal of Food Engineering* 34(4); 1997; 473-481

A laboratory wet-milling process was used to determine starch yield and starch recovery of dent and flint corn dried under different drying conditions.

A comparison with undried samples was performed. For the undried samples the starch recovery was not significantly different between both var. It decreased as both initial moisture content of the grains and drying air temp. increased. The reduction in starch recovery as well as the contamination by protein was greater for the flint than for the dent corn. Swelling, solubility and initial gelatinization temp. of the starch derived from both var. were affected by the drying conditions. AA

PULSES

662
Singh (U). **Cooking quality of pulses.** *Journal of Food Science and Technology (India)* 36(1); 1999; 1-14

For economic and social reasons, the Indian sub-continent heavily depends on pulses as sources of proteins, minerals and vitamins in the daily diets of the people. Before being consumed, cooking is the most important household processing practice followed for pulses. Chickpea, pigeonpea, mung bean, urd bean, lentil, and field pea, are the pulse crops of significant dietary and economic importance in the region. Considerable resources have been directed towards enhancing the nutritional quality of pulses with respect to protein content, amino acids and antinutritional factors. Relatively less attention has been paid to the processing and cooking quality of these pulses. An attempt has been made to critically appraise such topics as availability of pulses, consumer preference, market demands, definition of cooking quality, mechanism of cooking process, methods of cooking, variability among pulse species, seed characteristics and pretreatments that affect the cooking time in pulses, storage practices and effects of cooking on the nutritional quality of pulses. AA

Azuki beans

663
Baik (B-K), Klamczynska (B) and Czuchajowska (Z). **Particle size of unsweetened azuki paste as related to cultivar and cooking time.** *Journal of Food Science* 63(2); 1998; 322-326

Characteristics of beans and effects of cooking time on yield, composition and particle size of unsweetened paste were evaluated in two types of azuki. Cv. Erimo was smaller in seed size, lower in starch but higher in protein content. Consequently, this cv. absorbed water faster and to a greater extent during soaking and cooking, and required shorter cooking time than large seeded WSU 262. Over 40% of unsweetened paste particles were smaller than 106 μm for cv. Erimo and less than 25% for WSU 262. As cooking time increased, paste yield ranged from 68.6% to 71.9% for cv. Erimo and from 57.3% to 74.2% for WSU 262. Sedimentation vol. of unsweetened azuki paste correlated with particles smaller than 106 μm ($r = 0.918$) and can be a useful test to estimate mean particle size of unsweetened azuki paste. AA

Bambara groundnuts

664
Barimalaa (IS) and Anoghalu (SC). **Effect of processing on certain antinutrients in bambara groundnut (*Vigna subterranea*) cotyledons.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 186-188

Cotyledons of two Nigerian var. of bambara groundnut were analysed for trypsin inhibitor activity (TIA) and polyphenols after whole beans had, in each case, bean cold-soaked, hot-soaked, cold-soaked/germinated and dehulled. Another portion of beans was fermented after they had been cold-soaked, dehulled and boiled for 10 min (pretreatment), simulating the '*dawa dawa*' process. Germination made dehulling of the beans very easy, as the hulls broke open during the process, but was not very effective in reducing the polyphenol levels (9%, av. loss) and TIA (17%, av. loss). The combined pretreatment/fermentation process reduced the polyphenol level and TIA by 24% and 40%, resp. (av. losses). Hot-soaking considerably improved the dehulling properties of the beans over cold-soaking and was more effective in reducing the TIA level in the cotyledons (31%, av. loss) than cold-soaking (12%, av. loss). Polyphenol losses by the two conditioning methods were similar (9%, av.). Generally, losses in polyphenols and TIA could be attributed to leaching and inactivation resp. during the processes involved. The results show that a combination of two or more simple processing methods could be used to improve the food value of bambara groundnut. AA

Beans

665

Genovese (MI) and Lajolo (FM). **Influence of naturally acid-soluble proteins from beans (*Phaseolus vulgaris* L.) on *in vitro* digestibility determination.** *Food Chemistry* 62(3); 1998; 315-323

The *in vitro* digestibility of bean (*Phaseolus vulgaris*) protein fractions was studied using a pepsin-pancreatin system. Enzymatic hydrolysis was stopped by adding a strong acid and the extent of proteolysis determined by measurement of free amino groups in the soluble fraction. The *in vitro* digestibility of bean protein fractions was low when in the native state and was differently affected by denaturation. For phaseolin, the main reserve protein, heating caused a significant increase of susceptibility to hydrolysis, whereas heat had no apparent effect on digestibility of glutelins and albumins (II). For the PIL (protease inhibitor-lectin rich) fraction, which was shown to have a composition similar to total albumins, there was a decrease of digestibility, probably associated to disulphide bond formation upon heating. Results of *in vitro* digestibility were shown to be strongly dependent on the utilization of a sample blank to account for proteins naturally soluble in the acid used to interrupt hydrolysis, which would otherwise be estimated as digested protein. These proteins are characterized by a high carbohydrate content, probably responsible for their high solubility and low digestibility. AA

Chickpeas

666

Liu (LH) and Hung (TV). **Functional properties of acetylated chickpea proteins.** *Journal of Food Science* 63(2); 1998; 331-337

Functional properties were investigated on chickpea proteins acetylated at 6 and 49% of the -amino groups of lysine. In water and in 0.25 M NaCl sol., acetylated chickpea proteins (ACP) were more soluble at high pH (pH > 8), but less soluble at low pH (pH 2-7), than native chickpea protein (NCP). The solubility of ACP and NCP was reduced in 0.25-0.75 M $CaCl_2$, sol. Acetylation increased the water and oil absorption capacity of ACP. ACP also had higher emulsion capacity than that of NCP, but acetylation made emulsions of chickpea protein dispersions less stable. AA

667

Liu (LH) and Hung (TV). **Flow properties of chickpea proteins.** *Journal of Food Science* 63(2); 1998; 229-233

Flow properties of aqueous chickpea protein dispersions were investigated. The dispersions had Newtonian flow behaviour at concn. up to 4%. Flow behaviour became progressively less Newtonian as concn. increased above 4%. The apparent viscosity of the dispersions was pH and concn. dependent, being higher at the protein's most soluble pHs (pH 2 and 9) and lower at the isoelectric point (pH 4-5). Within the investigated temp. (15, 25, 35 and 55°C), power law constants were unchanged up to 35°C but the flow behaviour became non-Newtonian at 55°C. Denaturation by urea and sodium dodecyl sulphate (SDS) increased the consistency index (m), Casson yield stress and apparent viscosities, and the flow became more pseudoplastic with a decrease in the flow index (n). AA

OILSEEDS AND NUTS

Crambe abyssinica

668

Massoura (E), Vereijken (JM), Kolster (P) and Derksen (JTP). **Proteins from *Crambe abyssinica* oilseed: II. Biochemical and functional properties.** *Journal of the American Oil Chemist's Society* 75(3); 1998; 329-335

A method was developed to isolate proteins from the seed of *Crambe abyssinica*. This procedure resulted in 2 fractions, an isoelectric precipitate (Fraction 1) and a retentate after ultrafiltration (Fraction 2). Biochemical and functional properties of both fractions were studied. Gel permeation chromatography revealed that high-mol.-wt. proteins (669,000 Da) are present only in Fraction 1, whereas Fraction 2 consists of proteins with lower mol. wt. (< 200,000 Da). SDS-PAGE, in the presence of mercaptoethanol, showed that both fractions consist of proteins that range mainly from 40,000 to < 14,400 Da. Fraction 1 was highly soluble only at acid and alkaline pH values, while the solubility of Fraction 2 remained high (80%) over the

whole pH range tested. Addition of NaCl did not have any profound effect on the solubility of Fraction 2, but it increased significantly that of Fraction 1 in the isoelectric range. Foaming properties of Fraction 1 were better than those of chicken egg white only at pH 9, whereas those of Fraction 2 were superior at almost every pH value studied. Addition of NaCl improved significantly the foaming properties of Fraction 1 at all pH values tested but did not have a profound effect on the foaming properties of Fraction 2. Both fractions had good emulsifying properties only at alkaline pH values. These properties may be exploitable in potential food applications (e.g., as a substitute for chicken egg white). AA

669

Massoura (E), Vereijken (JM), Kolster (P) and Derksen (JTP). **Proteins from *Crambe abyssinica* oilseed: I. Isolation procedure.** *Journal of the American Oil Chemist's Society* 75(3); 1998; 323-327

Crambe abyssinica is a promising new oil crop because of the specific properties of its oil. A method for the isolation of proteins from *Crambe* seeds was developed. Protein extractability for whole and dehulled *Crambe* meal was studied as a function of pH. Highest extractability was obtained with dehulled meal at pH 11. Double extraction at this pH increased the extractability to about 66%. Protein precipitation from the above-mentioned extract was studied as a function of pH with and without addition of a precipitating agent, i.e., carboxymethylcellulose (CMC). Addition of CMC resulted in a protein recovery of about 75% at pH 4.4. Without CMC, about half of the protein was recovered by isoelectric precipitation. The remaining soluble protein could be conc. by ultrafiltration with a recovery of about 65%. The developed process, not including CMC addition, results in two protein fractions, i.e., an isoelectric precipitate (protein content 75%) and a retentate (protein content 87%), which together account for about 50% of the protein present in *Crambe* meal. Application of heat decreased protein extractability, but the protein contents of the resulting fractions were comparable to those form non-heat-treated meal. AA

Groundnuts

670

McNeill (KL) and Sanders (TH). **Maturity effects on sensory and storage quality of roasted Virginia-type peanuts.** *Journal of Food Science* 63(2); 1998; 366-369

Soybeans

671

Garcia (MC), Marina (ML), Laborda (F) and Torre (M). **Chemical characterization of commercial soybean products.** *Food Chemistry* 62(3); 1998; 325-331

Some commercial soybean products-soybean protein isolate, soybean flour, textured soybean, whole soybeans, and soybean dairy-like products (liquid and powdered milks, shake, yoghurt, and infant formulas)-have been analyzed for their content in solids, ash, pH, acidity, protein, fat, P and some metal ions (Ca, Cu, Fe, K and Zn). The differences found in the protein, P, and metal ion content and other chemical properties of these products are discussed, taking into account the procedures used to produce the above derivatives. AA

672

Bau (H-M), Villaume (C), Nicolas (J-P) and Mejean (L). **Effect of germination on chemical composition, biochemical constituents and antinutritional factors of soybean (*Glycine max*) seeds.** *Journal of the Science of Food and Agriculture* 73(1); 1997; 1-9

Aspects considered in this review are: chemical composition and biochemical constituents of seeds, (proteins, lipids, starch content, dietary fibres, mineral contents, vitamins), antinutritional factors (α-galactoside), carbohydrates, trypsin inhibitor activity (TIA), phytic acid, lectins (haemaglutinins) and lipase inhibitors. 87 references. BV

Soy products

Soy milk

673

Njoku (OU), Ngandu (FT) and Alumunah (EO). **Effect of soybean milk on rat serum lipid levels.** *Journal of Food Science and Technology (India)* 36(1); 1999; 55-57

The effect of soy milk on rat serum lipid levels was investigated using weanling male albino rats. The results showed that rats fed soy milk gained more wt. than the control groups ($P < 0.01$). Similarly, soy milk was found to decrease serum lipids (total cholesterol, triacylglycerol and phospholipid), while the HDL-cholesterol fractions increased ($P < 0.01$). The implication of soy milk in disease states associated with lipid metabolism is discussed. AA

Soy sauce

674

Masuda (S), Hara-Kudo (Y) and Kumagai (S). **Reduction of *Escherichia coli* O157:H7 populations in soy sauce, a fermented seasoning.** *Journal of Food Protection* 61(6); 1998; 657-661

Five *Escherichia coli* O157:H7 strains in soy sauce which was incubated at 4, 18, or 30°C after inoculation were studied. The cell numbers of *E. coli* O157:H7 decreased to an undetectable level (< 20 cfu/ml) within 9 days in all the soy sauce samples at 30°C, but did not decrease in the 0.1 M phosphate-buffered saline (pH 7.0) control sol. under the same conditions. Soy sauce reduced the cell numbers of bacteria at 18°C to a lesser extent than at 30°C, but to a greater extent than at 4°C. Components of soy sauce such as 10% or 16% NaCl, 5% ethanol, lactic acid, or acetic acid at pH 4.5, sodium benzoate (0.6 g/kg), or p-hydroxybenzoic acid n-butyl ester (0.05 g/l) caused a reduction of the *E. coli* O157:H7 population at 30°C, and the anti-*E. coli* O157:H7 effect of each component was less than that of soy sauce. The fat of *E. coli* O157:H7 cells in a buffered sol. containing various components of soy sauce resembled that in soy sauce at 30°C, which demonstrated the importance of the combination of the soy sauce components for its anti-*E. coli* O157:H7 action. AA

Tofu

675

Cai (TD) and Chang (KC). **Dry *tofu* characteristics affected by soymilk solid content and coagulation time.** *Journal of Food Quality* 20(5); 1997; 391-402

The effects of soymilk (SM) solid content (°Brix) and coagulation time on the yield, proximate composition, and textural characteristics of dry *tofu* were investigated. SM °Brix significantly ($P < 0.05$) influenced *tofu* yield, fracturability, hardness, springiness, cohesiveness, and chewiness. Among SM °Brix of 7.1, 7.8, 8.4 and 9.2 tested, °Brix 9.2 (9:1 water/bean ratio) produced the lowest yield (201 g/100 g bean), but the highest fracturability, hardness, cohesiveness, springiness, and chewiness. Coagulation time for 5 min resulted in a significantly lower *tofu* yield but higher cohesiveness than coagulation for 15 min. The fracturability and hardness of *tofu* from 9.2 °Brix SM coagulated for 5 min were greatest (18.0 and 19.6 kg, resp.). Lower SM °Brix and longer coagulation time produced *tofu* with a significantly higher moisture content. Dry *tofu* contained approx. 75-78% moisture (wet basis), 55-58% protein (dry basis), and 20-23% fat (dry basis). AA

Soy proteins

676

Wang (C), Ma (Q), Pagadala (S), Sherrard (MS) and Krishnan (PG). **Changes of isoflavones during processing of soy protein isolates.** *Journal of the American Oil Chemist's Society* 75(3); 1998; 337-341

Soy protein isolate (SPI) is made by extracting soy flour (SF) under slightly alkaline pH, followed by precipitation, washing, and drying. This study investigates the mass balance of different isoflavones during manufacturing of SPI and provides information on preservation of soy isoflavones in soy protein ingredients. Results indicated that only about 26% of the total isoflavones in SF remained in SPI. The percentages of total isoflavones lost during extraction, precipitation and washing were 19, 14 and 22% resp. GS

677

Gennadios (A), Rhim (JW), Handa (A), Weller (CL) and Hanna (MA). **Ultraviolet radiation affects physical and molecular properties of soy protein films.** *Journal of Food Science* 63(2); 1998; 225-228

Films were cast from heated, alkaline aqueous sol. of soy protein (5 g/100 mL water) and glycerin (50% w/w of protein). Control and ultraviolet (UV) irradiated (13.0, 25.9, 38.9, 51.8, 77.8, or 103.7 J/m^2) films were evaluated for tensile strength (TS), elongation at break (E), water vapour permeability (WVP), and Hunter L, a and b colour values. TS increased ($P < 0.05$) linearly while E decreased

linearly with UV dosage. WVP was not affected ($P > 0.05$) by UV irradiation. UV treatment intensified the yellowish coloration of films (increased +b values). SDS-PAGE patterns for UV-treated samples revealed bands of aggregates, increasing in intensity with UV dosage, which were absent in control samples. These changes suggested UV-induced cross-linking in films. AA

TUBERS AND VEGETABLES

Vegetables

678
Tijskens (LMM), Rodis (PS), Hertog (MLATM), Waldron (KW), Ingham (L), Proxenia (N), van Dijk (C). **Activity of peroxidase during blanching of peaches, carrots and potatoes.** *Journal of Food Engineering* 34(4); 1997; 355-370

Peroxidase (POD) activity was measured in peaches, carrots and potatoes after blanching treatments at different constant temp. Two isoenzymes exist, one bound and one soluble. The bound form can be converted into the soluble form by a temp.-dependent conversion reaction. Both forms are susceptible to heat denaturation. However, the conversion precedes the denaturation of the bound form. Heat denaturation of the enzymes could be described using an exponential decay (first order reaction). The temp. dependence of all reaction rates could be described by Arrhenius law. The simultaneous analysis of bound and soluble POD in peaches explained 96.4% of the observed variance. The analysis for carrots and potatoes on bound POD alone, yielded a percentage variance accounted for of 94.5 and 70%, resp. AA

679
Cronin (K) and Kearney (S). **Monte Carlo modelling of a vegetable tray dryer.** *Journal of Food Engineering* 35(2); 1998; 233-250

The objective in food dehydration is to dry the product to a specified uniform moisture content. In practice, a distribution in final moisture content is unavoidable, arising from the intrinsic variability of food properties and the probabilistic nature of the food drying process. For commercial dryers there are significant costs associated with this deviation in final moisture. To investigate the variability in the dehydration of vegetables, a model of a tray dryer was constructed, based on the empirical Page equation. It was solved using the Monte Carlo technique by describing the initial moisture content and the drying rate with probability distribution functions. A series of experiments were conducted to provide constants and statistical data for the model and to validate it. The utility of this approach is illustrated by applying the probabilistic drying model to quantifying and optimizing the final moisture content distribution. AA

680
Tijskens (LMM), Waldron (KW), Ng (A), Ingham (L) and van Dijk (C). **The kinetics of pectin methyl esterase in potatoes and carrots during blanching.** *Journal of Food Engineering* 34(4); 1997; 371-385

The activity of pectin methyl esterase (PE) in potatoes and carrots during blanching treatments was modelled and analysed. Two iso-enzymes were found to exist, one bound and one soluble. The bound form can be converted into the soluble form. These iso-enzymes have a different susceptibility to conversion and heat denaturation. All rate constants of reaction were modelled as dependent on temp. according to Arrhenius law. Regardless of the daily variance in measuring the series, the variance accounted for by the model in multivariate nonlinear regression analysis was more than 90% for both the individual activity data and the mean data. The same model formulation could be applied for activities assayed against pectin of 8% and of 68% esterification. The parameter values obtained were highly comparable in both analyses. AA

681
Masrizal (MA), Giraud (DW) and Driskell (JA). **Retention of vitamin C, iron and β-carotene in vegetables prepared using different cooking methods.** *Journal of Food Quality* 20(5); 1997; 403-418

The true retention of vitamin C, Fe, and β-carotene in 5 vegetables cooked by household microwave-steaming, stir-frying with oil (SFWO), stir-frying with water and boiling to equal degrees of overall acceptability were compared. Vegetables prepared by microwave-steaming and SFWO had significantly higher (means of 1.31- to 1.83-fold) vitamin C retention values than those which were boiled. Fe retention was significantly higher (means

boiled. Fe retention was significantly higher (means of 1.17- to 1.34-fold) in 4 of 5 vegetables cooked by microwave-steaming rather than by boiling. β-Carotene retention in 4 of 5 vegetables cooked by the different methods was similar. Overall, higher retention values were observed in vegetables cooked by microwave-steaming and SPWO. AA

682

Bobin-Dubigeon (C), Lahaye (M) and Barry (J-L). **Human colonic bacterial degradability of dietary fibres from sea-lettuce (*Ulva* sp.).** *Journal of the Science of Food and Agriculture* 73(2); 1997; 149-159

Sea-lettuce (*Ulva* sp.) is one of the commonly consumed seaweeds which contains 16.5% of water-soluble and 13.3% insoluble dietary fibres. Since physiological effects of fibres are partly related to their colonic bacteria fermentability, *Ulva* sp. and its constitutive soluble and insoluble fibres were incubated with faecal bacteria in an *in vitro* batch fermenter system. After 24 h of incubation, 32.0 plus or minus 0.4%, 25.9 plus or minus 0.4% and 50.9 plus or minus 7.4% of *Ulva*, soluble and insoluble fibres constitutive sugars, resp., were degraded. Consequently, *Ulva* and its soluble fibre, ulvan, are poorly fermented by colonic bacteria. The consitutive sugars, rhamnose and glucuronate and the aldobiouronate β-D-glucuronosyluronate-(1,4)-L-rhamnose of the glucuronoxylorhamnan sulphate present in the soluble fibre are highly fermented. Chemical desulphation and/or carboxyl group reduction did not modify this fermentation behaviour. Thus, the particular chemical structure of ulvan is responsible for the resistance of this polysaccharide and of *Ulva* to colonic bacterial fermentation. As a physiological consequence of this particular behaviour, consumption of dietary fibres from sea-lettuce could be expected to act mainly as bulking agents with little effect on nutrient metabolism due to colonic bacterial fermentation products (short-chain fatty acids). AA

Asparagus

683

Lopez (G), Ros (G), Rincon (F), Martinez (C), Periago (M), Ortuno (J). **Modifications in the mineral content of green asparagus (*Asparagus officinalis*, L.) during development and processing (blanching and canning).** *Journal of Food Quality* 20(5); 1997; 461-469

Five commercial sizes of green asparagus (fine, middle, thick, very thick and extra thick) were examined at different stages of commercial treatment (blanched and canned) to study possible changes in six minerals (Cu, Zn, Fe, Mn, Ca and Mg) and the ash content. Significant changes were only found in the Fe and Mg content in washed asparagus of different commercial sizes. Blanching must be considered a moderate step because it only modified the levels of the Fe and Ca in some sizes. Canning, however, resulted in a leaching of Cu, Zn, Mn, Fe and Mg, and the up-take of Ca. The size of green asparagus was a source of variation in the Mn, Fe and Ca contents after canning. The highest gains after canning for Ca were detected in the biggest sizes. AA

684

Lopez (MAA), Cosano (GZ) and Rojas (RM). **The influence of frozen storage on chromium and nickel contents in white asparagus.** *Journal of Food Quality* 20(6); 1997; 525-532

685

Begum (S) and Brewer (MS). **Microwaveblanching effects on colour, chemical and sensory characteristics of frozen asparagus.** *Journal of Food Quality* 20(6); 1997; 471-481

Asparagus was blanched for 4 min using: conventional boiling water (BW), steam (ST), microwave (MW), or microwave heated in boilable bags (MWB). Samples were ice-cooled, bagged, heat-sealed and stored at -18°C for 4 wks. Peroxidase activity was reduced from 98-114 units in fresh, unblanched to 1-7 units in blanched asparagus. Reduced ascorbic acid (RAA) content in fresh, unblanched asparagus was approx. 49 mg/100 g; RAA content in fresh, BW-blanched asparagus was approx. 49 mg/100 g. Frozen, unblanched asparagus retained about 40% of original RAA content; BW-blanched asparagus retained 61%, and MWB-blanched asparagus retained 87%. After frozen storage all samples were darker than freshly blanched samples. Blanching increased and freezing decreased greenness of all samples. Blanching increased yellowness of fresh samples; after frozen storage, blanching treatment differences were lost. Unblanched samples had the highest appearance scores; unblanched and MW-blanched samples had the highest colour scores. Overall quality of the microwave blanched asparagus was as good as or superior to conventionally blanched asparagus. AA

Beetroots

686
Osornio (MML) and Chaves (AR). **Quality changes in stored raw grated beetroots as affected by temperature and packaging film.** *Journal of Food Science* 63(2); 1998; 327-330

The effects of modified atm. storage on raw grated beetroots (*Beta vulgaris*) quality; and biochemical/chemical changes during storage for 7 days at 0° or 4°C were studied. A thermal abuse (transfer to 20°C) was also studied during storage. Washed, grated and packaged beetroots in trays wrapped with two films of different gas permeabilities, were stored at 0°C or 4°C for a wk. and then transferred to 20°C. Changes in atmospheric composition, pigment content, pH, titratable acidity and production of exudate were monitored. Shelf life of grated beetroots was 7 days at 0°C and 3 to 4 days at 4°C. A notable decrease in pigment content during storage, was noticed. GS

Bittergourd

687
Ramah (S), Manimegalai (G) and Vennila (P). **Studies on steeping preservation of bittergourd in acidified brine solution.** *Journal of Food Science and Technology (India)* 36(1); 1999; 78-80

Three var. of bittergourd viz., 'Small Green', 'Long Green' and 'Co 1' were preserved at room temp. by steeping in soak sol. containing (a) 2.0% salt, 0.5% acetic acid and 200 ppm of SO_2 and (b) 2.0% salt, 1.0% acetic acid and 200 ppm of SO_2. During the 90 days of storage, significant reductions in ascorbic acid, chlorophyll and bitter principle were noticed in the steeped samples. The penetration of salt and acid reached over 80 and 68%, resp., of the total penetration, which occurred steadily from the 15th day of storage. The treated bittergourd samples were microbiologically safe and also found to be suitable for the preparations of different South Indian dishes. AA

Broccoli

688
Hansen (M), Laustsen (AM), Olsen (CE), Poll (L) and Sorensen (H). **Chemical and sensory quality of broccoli (*Brassica oleracea* L. var. *italica*).** *Journal of Food Quality* 20(5); 1997; 441-459

Five cvs. of broccoli (*Brassica oleracea* L. var. *italica*) were analyzed for individual glucosinolates, S-methylcysteine sulphoxide (SMCSO), aroma volatiles and sensory quality. Total glucosinolate content ranged from 47 to 93 µmol g dry wt.$^{-1}$, and SMCSO ranged from 22 to 57 µmol g dry wt.$^{-1}$. A total of 11 glucosinolates were identified in the broccoli cvs. The major glucosinolates were: progoitrin, glucoiberin, glucoraphanin, glucobrassicin and neo-glucobrassicin and they accounted for more than 95% of the total content. Glucoiberin was only found in appreciable amounts in purple-headed broccoli. Pentanol, pentanal, hexanal, heptanal and nonanal were the most abundant higher boiling volatiles isolated from cooked broccoli using dynamic headspace trapping on Porapak and solvent desorption with diethyl ether. Sensory analysis by a trained panel showed that scores for cooked vegetable odour ('hay' and green peapod') were significantly different between cvs. In contrast, scores related to *Brassica* odour ('cauliflower' and 'mustard') were not significantly different. The content of individual glucosinolates, SMCSO and higher boiling volatiles in the cvs is discussed in relation to the sensory quality of the cooked product. AA

Cabbages

689
Pirovani (ME), Guemes (DR), Piagentini (AM) and Pentima (JHD). **Storage quality of minimally processed cabbage packaged in plastic films.** *Journal of Food Quality* 20(5); 1997; 381-389

The effects of packaging and storage at 3°C in a refrigerated case on quality changes of minimally processed cabbage were studied. Shredded cabbage samples were packaged in three forms; bags of monooriented polypropylene film (MOPP bags) and polyethylene trays overwrapped with a multilayer polyolefin (RD106-PE tray) or with a plasticized PVC film (PVC-PE tray). All types of package effectively controlled the wt. loss. The modified atm. in PVC- and RD106-PE trays did not change more than 3% as compared with normal atm. levels. However, in MOPP bags, O_2 reached 2% and CO_2 increased to approx. 13% after 3 days. The microbiological quality during the storage period for all types of packaging was satisfactory. OPP samples were significantly better ($P < 0.05$) in

general appearance, wilting and browning but developed an off-odour. No off-odour was detected in samples packaged in PVC and RD106-PE trays. Shelf-life for the 3 packaging forms was estimated. AA

Carrots

690

Svanberg (SJM), Nyman (EMG-L), Andersson (R) and Nilsson (T). **Effects of boiling and storage on dietary fibre and digestible carbohydrates in various cultivars of carrots.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 245-254

The influence of boiling and storage on dietary fibre (DF) and digestible carbohydrates was investigated in eight different carrot cvs. The content of total DF was in the range 252-291 g kg^{-1} DW and was generally at the higher end for the early cvs. and at the lower end for the late ones. During storage, there was a decrease in the soluble fibre content in all cvs. and generally an increase in insoluble fibre. Following boiling, the loss of DF varied considerably between cvs. After storage, the loss could be correlated to the av. root wt. of the carrot cvs. The total content of glucose, fructose and sucrose was rather similar in the various cvs., whereas their individual distribution differed. Storage had generally minor influence on the sugar content, except in the cvs. Amarant and Bull. On boiling, the loss was solely dependent on the initial sugar concn. After storage the loss increased, which could be related to the lower dry matter content. The choice of cv. and storage time is important in interpreting analytical data from carrots and is probably of similar significance in other vegetables when studying effects of heat treatment. AA

691

Rastogi (NK) and Raghavarao (KSMS). **Water and solute diffusion coefficients of carrot as a function of temperature and concentration during osmotic dehydration.** *Journal of Food Engineering* 34(4); 1997; 429-440

Mass transfer was quantitatively investigated during osmotic dehydration of fresh carrot over a range of concn. (40-70°B) and temp. (30-50°C) of osmotic sol. Effective diffusion coeff. of water as well as sucrose were estimated using the sol. of Fick's unsteady state law. Multilinear analysis of the estimated effective diffusion coeff. of water and solute revealed that these values depend upon temp. and concn. of the osmotic sol. as well as the combined effect of temp. and concn. AA

Cassava

692

Bainbridge (Z), Harding (S), French (L), Kapinga (R) and Westby (A). **A study of the role of tissue disruption in the removal of cyanogens during cassava root processing.** *Food Chemistry* 62(3); 1998; 291-297

Sun-drying as a means to reduce the cyanogen content of cassava roots is commonly known to be inefficient. This paper reports on modifications to the processing procedure used for sun-drying and their effectiveness at removing potentially toxic cyanogenic glucosides. Commonly used processing methods were compared. Crushing cassava root pieces prior to drying was found to significantly improve the efficiency of cyanogen removal by, on av., 22% during laboratory experiments and 12% during field trials. The crushing procedure was optimized and a low cost prototype crusher developed. A reduction in the processing time resulted from crushing the root disks prior to drying. The processing method involving crushing was ranked second in terms of efficiency of cyanogen removal in a comparative study of sun-dry processing methods that are commonly used in East Africa. Pounding cassava to small pieces in a traditional pestle and mortar prior to drying was the most efficient, providing 90% removal of cyanogens. Pounding and crushing cassava prior to sun-drying were significantly better than all other root preparation pre-treatments evaluated. AA

Cucumber

693

Wang (CY) and Qi (L). **Controlled atmosphere storage affects quality and chilling susceptibility of cucumbers.** *Journal of Food Quality* 20(6); 1997; 559-566

Controlled atm. (CA) maintained the quality of cucumbers better than conventional refrigerated storage at 5°C. Elevated levels of CO_2 (3%) and decreased concn. of O_2 (1 and 15%) also increased the tolerance of cucumbers to chilling exposure. The content of sugars, including fructose and glucose; and organic acids, particularly malic acid, were

maintained at higher levels in CA-stored cucumbers than in air-stored samples. The respiration rates (measured as CO_2 production) of cucumber fruit during storage at 5°C were markedly suppressed under CA conditions. Contrary to reports in the literature, CA storage was found to be beneficial in reducing chilling injury and maintaining cucumber quality. AA

Leafy vegetables

694
Bakr (AA) and Gawish (RA). **Trials to reduce nitrate and oxalate content in some leafy vegetables: 2. Interactive effects of the manipulating of the soil nutrient supply, different blanching media and preservation methods followed by cooking process.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 169-178

The influence of processing (freezing, and canning followed by cooking) on the accumulation of nitrate and oxalate and other nutritional aspects of spinach is examined. No significant losses in the important vitamins and minerals are noticed in spinach upon processing when 0.1% Ca citrate and 0.01% sodium ascorbate were used as a blanching media. High yield and low nitrate and oxalate contents in lettuce and spinach can be achieved by fertilizing with manure and urea. BV

Potatoes

695
Waghmare (NV), Kotecha (PM) and Kadam (SS). **Effects of pre-treatments, storage of potato and antioxidants on quality of potato chips prepared from cultivars grown in Western Maharashtra.** *Journal of Food Science and Technology (India)* 36(1); 1999; 49-51

"Kufri Chandramukhi" tubers had higher total solids (19.55%) and specific gravity (1.089), which resulted in higher yield of chips as compared to "Kufri Jyoti". The optimum level of NaCl for slice thicknesses of 1 and 1.5 mm was 5%, while for slice thickness of 2 mm, 7.5% NaCl was found optimum. Potassium metabisulphite (KMS) at a concn. of 50 ppm was found optimum for slice thickness of 1 mm, while 100 ppm was found optimum for slice thicknesses of 1.5 and 2 mm. The blanching time of 1 min, however, was found optimum for all the 3 slice thicknesses. $CaCl_2$ at 0.25% was found optimum for 1 mm slice thickness, while 0.5% $CaCl_2$ was found optimum for 1.5 and 2 mm slices. The sharp decrease in oil content in chips prepared from potatoes stored at ambient conditions for 3 wks. was followed by sharp rise in oil content for chips made from potato stored for 9 wks. Chips prepared from potatoes stored at refrigerated temp. showed gradual decrease in oil content upto 6 wks. of storage. The use of tertiary butylated hydroquinone at the level of 200 µg/g of oil increased shelf-life of chips by 15 days. AA

696
Ahvenainen (RT), Hurme (EU), Hagg (M), Skytta (EH) and Laurila (EK). **Shelf-life of prepeeled potato cultivated, stored, and processed by various methods.** *Journal of Food Protection* 61(5); 1998; 591-600

The effects of cultivation conditions, winter storage, peeling method, browning prevention chemicals replacing sodium bisulphite, and packing methods on the sensory, nutritional and microbiological quality of pre-peeled potato were examined. Two different cultivation lots of the potato var. Van Gogh were used. Cultivation and harvesting conditions and peeling method were the most important facts reducing the sensory quality, especially the appearance, of prepeeled and sliced potatoes. Cooking and baking of potatoes decreased the appearance defects detected in raw potatoes. The levels of vitamin C in packaged samples decreased during winter storage. Cooking for 10 min and keeping potatoes at 60°C for 1 h after cooking also decreased the content of vitamin C. In potato samples immediately after treatments aerobic bacteria were present at levels of 400 to 2,950 cfu/g and lactic acid bacteria (LAB) at levels of 8 to 16 cfu/g. The number of aerobic bacteria did not increase during storage, and the number of LAB increased at the most to 90 cfu/g. Peeling, washing and packaging methods, cultivation conditions, and winter storage did not have important effects on the number of microbes present. AA

Radish

697
Giusti (MM), Rodriguez-Saona (LE), Baggett (JR), Reed (GL), Durst (RW), Wrolstad (RE). **Anthocyanin pigment composition of red radish cultivars as potential food colorants.** *Journal of Food Science* 63(2); 1998; 219-224

Red radish (*Raphanus sativus* L.) cvs. were evaluated with respect to qualitative and quantitative anthocyanin (ACN) pigment content. Radishes were grown at 2 locations (Corvallis and Hermiston, OR) and harvested at 2 maturity stages. Pigment content was dependant on cv., root wt. and location, higher amounts being obtained at Hermiston. Spring cvs. (n = 22) had pigmentation in the skin, ranging from 39.3 to 185 mg ACN/100 g skin. Red-fleshed Winter cvs. (n = 5) had pigment content ranging from 12.2 to 53 mg ACN/100 g root. ACN profiles were similar for different cvs., the major pigments being pelargonidin-3-sophoroside-5-glucoside, mono- or di-acylated with cinnamic and malonic acids; individual proportions varied among cvs. Estimated pigment yields ranged from 1.3 to 14 kg/ha. AA

Tapioca

698

Sanni (LO), Atere (C) and Kuye (A). **Moisture sorption isotherms of fufu and tapioca at different temperatures.** *Journal of Food Engineering* 34(2); 1997; 203-212

Moisture sorption characteristics for two products of cassava, namely fufu and tapioca, at 25°C, 32°C and 45°C were studied for a_w ranging from 0.1 to 0.96. At a given a_w, the results show that the moisture content decreases with increasing temp. for fufu and tapioca. Eight sorption models were used to analyze the data. The GAB model showed the best fit, whereas the BET model was the poorest over the whole range of a_w. Also, estimates of the net isosteric heats of sorption and their dependence on moisture content were presented for each product. AA

Tomatoes

699

Porretta (S), Poli (G) and Minuti (E). **Tomato pulp quality from transgenic fruits with reduced polygalacturonase (PG).** *Food Chemistry* 62(3); 1998; 283-290

The physico-chemical and sensory properties of tomato pulps (i.e. diced tomatoes with 30% tomato juice as packing medium), prepared from transgenic tomato (*Lycopersicon esculentum*) fruits with reduced levels of polygalacturonase (PG) activity due to the expression of a PG antisense gene, were evaluated. The application of genetic modification yields products that have improved viscosity (40-60%), colour (30-40%) and many sensory attributes in comparison with their conventional counterparts. AA

700

Thakur (BR), Singh (RK) and Nelson (PE). **Effect of pH and soluble solids on the serum viscosity and serum and serum colour of tomato juice at elevated tempeatures.** *Journal of Food Quality* 20(6); 1997; 495-500

Effects of heating time and temp., pH, and soluble solid levels on serum viscosity and serum colour of tomato juice were studied. The samples were canned in 18 mL TDT cans and exposed to processing temp. of 88°C, 102°C and 112°C for 30, 60 and 120 min. Depending upon the time and temp. of heating, and initial viscosity of the serum, the losses in viscosity ranged from 3.0-55.6% being higher in serum with higher initial viscosity. Percent losses in serum viscosity during heating of juice increased (6-60%) with increase in pH (3.8-4.9) and soluble solids (6°-24°) in the juice. An increase in pH and soluble solids also enhanced heat induced browning in the serum with values varying from 0.1-2.69. AA

FRUITS

701

Garcia-Viguera (C), Zafrilla (P) and Tomas-Barberan (FA). **Determination of authenticity of fruit jams by HPLC analysis of anthocyanins.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 207-213

A HPLC technique for the analysis of anthocyanins from various fruit jams (strawberry, blackberry, raspberry, blueberry, blackcurrant and cherry) is described and used to monitor the stability of anthocyanins during processing. Each product had a distinctive anthocyanin pattern which enabled identification and characterisation of each jam. The manufacturing process had no effect on the qualitative anthocyanin profile. AA

Apples

702

Richardson-Harman (N), Phelps (T), McDermott (S) and Gunson (A). **Use of tactile and visual cues in consumer judgements of apple ripeness.** *Journal of Sensory Studies* 13(2); 1998; 121-132

The relative importance of visual and tactile cues in consumer assessments of 'Royal Gala' apple ripeness were studied in relation to commercial maturity indices which included background colour, blush, wt. and skin greasiness. Apples were evaluated by consumers under 3 sensory conditions to isolate their use of visual and tactile cues. Individual fruit were harvested to provide apples which independently varied in background colour, blush and wt. Visual cues of skin colour were found to be greater drivers of perceived apple ripeness than tactile cues of skin greasiness and apple firmness. Amongst the visual cues tested, the hue of the background colour had the greatest impact on consumer judgements of 'Royal Gala' apple ripeness. Consumer's ideal 'Royal Gala' apple ripeness was achieved with a background colour between chip levels 5 and 8, blush coverage between 33-66% and weighing between 130-142 g. AA

703

Mavroudis (NE), Gekas (V) and Sjoholm (I). **Osmotic dehydration of apples: Effects of agitation and raw material characteristics.** *Journal of Food Engineering* 35(2); 1998; 191-209

The effects of agitation and structural differences on osmotic dehydration were investigated. Osmotic dehydration was performed in an agitated vessel at 20°C using a 50% sucrose sol. as the osmotic medium. The impeller's Reynolds number was used for agitation quantification. Samples were separated into inner and outer apple parenchymatic tissue, the intercellular space interconnectivity and aspect ratio (length to width ratio) being higher in inner than outer tissue. Structural differentiation revealed a strong effect on process responses. Solid gain (kg/kg i.m.) was higher in inner than in outer apple parenchymatic tissue independently of agitation level. Water loss (kg/kg i.m.) was lower in inner than outer apple parenchyma at the same Reynolds number. Water loss was higher in the turbulent flow region than in the laminar flow region. Thereby, external mass transfer limitations were verified for experimental conditions. Solid gain did not show significant differences between laminar and turbulent flow regions. The data indicate that free convection is the mechanism used by the sol. in pore penetration, although lack of understanding of this phenomenon at the cell level prevented conclusions from being drawn. Attempts to explain experimental variations revealed indications suggesting the influence of initial bulk density and initial water content on water loss and solid gain. AA

704

Anese (M), Manzano (M) and Nicoli (MC). **Quality of minimally processed apple slices using different modified atmosphere conditions.** *Journal of Food Quality* 20(5); 1997; 359-370

Fresh sliced apples were packaged in air, under vacuum or in the presence of nitrogen or CO_2-N atm. and stored at 4 and 20°C up to 20 days. Changes in colour and firmness and microbial growth were then evaluated at different storage times. The modified atm. (MAs) studied showed positive or negative effects on the quality retention of the packed apple slices depending on the indicator followed. Of the air packed samples, all the MAs studied were suitable in preventing enzymatic browning but they differently influenced the microbial growth. Firmness decay, which was scarcely affected by MAs, was sufficiently reduced under refrigerated storage conditions. CO_2-N and under vacuum packagings were the most effective in inhibiting microbial growth. AA

Guavas

705

Mandhyan (BL). **Retention of freshness of guavas with respect to package material.** *Journal of Food Science and Technology (India)* 36(1); 1999; 46-48

Six packaging materials were developed by laminating polythene with newspaper sheets and Al foil. Packaging boxes were also made by laminating three layers of polythene with four layers of newspapers. These materials were tested against traditional bamboo baskets lined with newspaper sheets for packaging guavas. It was revealed that the freshness of guavas could be significantly retained by packing them in rigid or flexible packages of the these materials. The freshness was quantified in terms of reduction in shear stress of guavas during the packing period of four days. The least reduction of shear stress of guavas i.e. 1.040 kg/cm^2 was

observed in pouches made of polythene, fused with Al foil followed by pouches made by paper, fused with polythene (polythene inside) i.e., 1.44 kg/cm^2. Boxes made with newspaper sheets fused with polythene also gave significantly lesser reduction in shear stress of guavas (1.966 kg/cm^2) than bamboo basket with newspapers lined inside (2.893 kg/cm^2). AA

Kiwifruits

706

Bonvehi (JS), Jorda (RE) and Jaen (JA). **The ripening process of kiwifruits (*Actinidia deliciosa*) grown in catalonia, Spain.** *Journal of Food Quality* 20(5); 1997; 371-380

Mangoes

707

Sagar (VR), Khurdiya (DS) and Balakrishnan (KA). **Quality of dehydrated ripe mango slices as affected by packaging material and mode of packaging.** *Journal of Food Science and Technology (India)* 36(1); 1999; 67-70

The influence of different packaging materials, low density polyethylene (LDPE) bags of 200 and 400 gauge and Al laminated polyethylene (ALPE) bags of 260 gauge as well as different modes of packs, air pack (AP), vacuum pack (VP) and nitrogen pack (NP) on the quality of dehydrated ripe mango slices were studied. It was observed that the nitrogen packed material with 260 gauge ALPE was most suitable for obtaining favourable results for retaining better quality and good colour of the dehydrated ripe mango slices. Significant interaction between mode and packing materials were observed for SO_2 and ascorbic acid. AA

Melons

708

Badifu (GIO) and Ebegonye (GM). **Effect of germination on chemical, physical and functional properties of defatted flour of melon (*Citrullus vulgaris* Schrad) kernel.** *Journal of Food Science and Technology (India)* 36(1); 1999; 63-66

Melon seeds (*Citrullus vulgaris* Schrad) germinated for 0 to 72 h were dried, defatted and milled into flour. Germination reduced oil content by 16.0% at 72 h. There was reduction in the water holding capacity of the defatted flour from 2.0 to 26.5% from kernels germinated for 24 to 72 h. Viscosity increased by 26.7% after 24 h germination; 80.2% after 48 and 66.7% after 72 h. The foam capacity of the defatted flour decreased with germination time, but foam stability increased in flour obtained from melon seeds germinated for 48 and 72 h. Germination had no effect on the pH of the flour. These data suggested that the viscosity, foam stability and foam capacity at 48 h after germination might affect the overall quality of a traditional soup-mix oseani, indigenous to Nigeria. AA

709

Oje (K), Alonge (AF) and Adigun (YJ). **Variation of physical properties of melon seeds at their different moisture levels.** *Journal of Food Science and Technology (India)* 36(1); 1999; 42-45

The effect of moisture level of melon seeds on their physical properties was studied. The black edged type 'Bara' var. had greater overall dimensions than the white edged type. Specific heat capacity and angle of repose increased while fractional porosity and true density decreased linearly with increase in moisture content. Static coeff. of friction increased with moisture content on four structural surfaces (Al, plywood with grains parallel and perpendicular to direction of motion and galvanized steel). AA

Oranges

710

Pao (S), Brown (GE) and Schneider (KR). **Challenge studies with selected pathogenic bacteria on freshly peeled Hamlin orange.** *Journal of Food Science* 63(2); 1998; 359-362

The survival and growth of *Salmonella* spp., *Escherichia coli* 0157:H7, *Listeria monocytogenes*, and *Staphylococcus aureus* on peeled Hamlin orange were examined. Fruits were peeled by infusing the peel with water to assist hand removal. The peeled oranges had an av. pH of 6.0-6.5 at the surface and 3.8 in the juice. After surface inoculation, peeled fruits were incubated for up to 14 days. Growth was observed with all tested pathogens only at the abusive storage temp. (24°C). Refrigeration (4 or 8°C) effectively inhibited the growth of all pathogens and caused population reduction of *Salmonella* spp. and *S. aureus*. AA

Pears

711
Sapers (GM) and Miller (RL). **Browning inhibition in fresh-cut pears.** *Journal of Food Science* 63(2); 1998; 342-346

Treatments to control browning and maintain quality of fresh-cut pears were evaluated. Pear wedges were dipped in sol. containing sodium erythorbate, $CaCl_2$ and 4-hexylresorcinol; packed in air or with a modified atm. (MAP); and stored at 4°C. Samples were evaluated for browning, microbial spoilage, and presence of off-flavours or loss of firmness. For treatments to be successful, pears had to be above a min. firmness of 4 kg (d'Anjou) or 5 kg (Bartlett) when treated. Inhibitor treatments, in conjunction with MAP, controlled browning and maintained quality of fresh-cut Bartlett and d'Anjou (but not Bosc pears) for 12-14 days. AA

Strawberries

712
Viberg (U), Freuler (S), Gekas (V) and Sjoholm (I). **Osmotic pretreatment of strawberries and shrinkage effects.** *Journal of Food Engineering* 35(2); 1998; 135-145

The shrinkage and increase in density resulting from an osmotic pretreatment were studied for two var. of strawberries, Honeoye and Dania. Aqueous sucrose sol. (20-85% w/w) and granulated sucrose were used as the osmotic media. A simplified model is presented where the shrinkage factor was correlated to changes in wt. Solids uptake was found to be of great importance of determining the final vol. of the strawberries. The two var. of strawberry correlated well to the proposed model with a correlation coeff. of $r^2 = 0.8995$ for the Honeoye and of $R^2 = 0.9465$ for the Dania. Pretreatment in a 60% (w/w) sucrose sol. gave the best result and resulted in an increased density combined with a small decrease in vol. The use of granulated sucrose resulted in the greatest shrinkage. Subsequent thermal processing did not notably change the vol. of the pretreated strawberries. AA

Watermelon

713
Pardo (JE), Gomez (R), Tardaguila (J), Amo (M) and Varon (R). **Quality evaluation of watermelon varieties (*Citrullus vulgaris* S.).** *Journal of Food Quality* 20(6); 1997; 547-557

The physical-chemical quality (pulp firmness, soluble solid content, sucrose, D-glucose and D-fructose concn. and colour measured by tristimulus colorimetry) and sensory quality (flavour, texture and colour) of 13 var. of watermelon were studied. Quantitative differences were established between the var. as was the relation between the instrumental and sensorial detn. The triploid (3n) var., Apirena, AR-3404 and AR-3406, and the diploid (2n), Sugar Baby, showed the highest soluble solids and total sugar values, although the first group was preferred by consumers as regards the three attributes studied. Instrumental analysis of colour made it possible to separate clearly the var. AA

CONFECTIONERY, STARCH AND SUGAR

Starch

714
Wang (W-C) and Sastry (SK). **Starch gelatinization in ohmic heating.** *Journal of Food Engineering* 34(3); 1997; 225-242

The effect of starch gelatinization on electrical conductivity (σ) was investigated in this study. Suspensions of corn and potato starch were prepared with a starch:water ratio of 1:5 (ww) by mixing with the appropriate amount of water. Suspensions were ohmically heated with agitation to 90°C by AC at 60 Hz, and a voltage gradient of 20 V/cm. Partially gelatinized and fully gelatinized samples, prepared by preheating suspensions to or beyond the gelatinization ranges, were also tested. Gelatinization energy (ΔH_G) and degree of gelatinization (%SG) of each sample were determined by differential scanning calorimetry (DSC) at a scanning rate of 10°C/min. The results showed that endothermic gelatinization peaks were found on both DSC thermograms and electrical conductivity curves, with similar shapes and temp. ranges. Data of %SG obtained from conductivity curves and DSC thermograms were in agreement in

low and midgelatinization ranges but were different when %SG was high, due to high ohmic heating rate. Electrical conductivity increased with temp., but decreased with degree of gelatinization, apparently caused by structural changes and an increase in bound water. AA

Sugars

715

Naranjo (GB), Malec (LS) and Vigo (MS). **Reducing sugars effect on available lysine loss of casein by moderate heat treatment.** *Food Chemistry* 62(3); 1998; 309-313

In order to investigate the effect of various reducing sugars on the available lysine loss by Maillard reaction, four model systems were prepared by mixing casein with glucose, fructose, lactose or maltose, followed by storage at 37°C, 50°C and 60°C. The available lysine contents were monitored periodically. Highest and lowest reaction rates were observed in the model systems containing glucose and fructose, resp., at the 3 temp. The 2 disaccharides behaved very similarly, with reaction rates between those of the monosaccharides studied. The activation energies of glucose, lactose and maltose systems were similar (116-132 kJ mol^{-1}), while that of fructose was somewhat higher (166 kJ mol^{-1}). This difference was supposed to be in part due to the different mechanism of tautomerization of fructose, highly dependent on temp. Therefore, though the potential nutritional damage at moderate temp. is lower when fructose is used instead of other reducing sugars, its higher activation energy can reverse the effect at higher temp. AA

BAKERY PRODUCTS

Bread

716

Corsetti (A), Gobbetti (M), Balestrieri (F), Paoletti (F), Russi (L), Rossi (J). **Sourdough lactic acid bacteria effects on bread firmness and staling.** *Journal of Food Science* 63(2); 1998; 347-351

Lactobacillus sanfrancisco CB1 and *Lactobacillus plantarum* DC400 were the most proteolytic and amylolytic strains studied. Breads started with LAB and yeasts had higher vol. than the baker's yeast-started bread. One bread with the highest initial firmness (*Saccharomyces cerevisiae* 141-*L. plantarum* DC400 starter) had the lowest final firmness. Breads produced with LAB showed the lowest enthalpy throughout 144 h. After 24 h storage the associations of *S. cerevisiae* 141 and *L. sanfrancisco* CB1 or *L. plantarum* DC400 gave a very low percentage increase of enthalpy compared to that from yeast alone. The enthalpy increased markedly when other LAB, neither proteolytic nor amylolytic, were used. AA

717

Savita Sharma, Sekhon (KS) and Nagi (HPS). **Suitability of durum wheat for flat bread production.** *Journal of Food Science and Technology (India)* 36(1); 1999; 61-62

Durum wheat was evaluated for the production of flat bread. Flat breads of soft texture, pleasing flavour and yellowish creamy colour were prepared from durum flour. Bread and chapati from durum flour were not of high acceptability showing that durum was not that suitable for making good quality bread and chapati but good quality flat bread could be prepared from durum wheat. AA.

Crackers

718

Kohyama (K) and Nishi (M). **Direct measurement of biting pressures for crackers using a multiple-point sheet sensor.** *Journal of Texture Studies* 28(6); 1997; 605-617

A multiple-point sheet sensor was used to observe the distribution of surface pressure during the biting of crackers adjusted to various a_w. The textural characteristics were clearly reflected in the three-dimensional displays so obtained. Textural differences between samples were most evident in the first 0.3 s. The magnitude, position and duration of biting pressure varied among subjects. For all subjects, crisp crackers with low a_w showed a large pressure distribution with respect to both time and position. Samples with high a_w displayed a higher max. force on the area under the incisors than samples with low a_ws and required more work per incision. These results are opposite to the rheometric data measured with a single-point sensor. Using this method, textural differences due to the mechanical and geometrical properties of food

could be displayed, and also could evaluate their changes in the oral cavity during biting. AA

Snacks

719

Anon. **Determination of fat in olestra-containing savory snack products by capillary gas chromatography.** *Journal of AOAC International* 81(4); 1998; 848-868

MILK AND DAIRY PRODUCTS

Milk

720

Velez-Ruiz (JF) and Barbosa-Canovas (GV). **Rheological properties of concentrated milk as a function of concentration, temperature and storage time.** *Journal of Food Engineering* 35(2); 1998; 177-190

The flow properties of conc. milk were evaluated between concn. of 12.6 and 48.6% solids content, at three temp. and through 4 wks. of storage. Three rheological models, Newton, power law and Herschel-Bulkley, were applied to fit the flow behaviour of milk conc. depending on the concn. level. The resulting flow behaviour indices and consistency coeff. were correlated to concn. by a single term exponential equations, with only two conc., 42.4 and 48.6% solids contents exhibiting yield stress. The effect of the temp. studied on the flow behaviour index was minimal, though noticeable on the consistency coeff., and at the three selected temp. (5, 15 and 25°C) the flow behaviour index decreased with storage time while the consistency coeff. increased. The energy of activation for flow (evaluated with an Arrhenius type equation) increased with concn. and storage time and ranged from 2.42 to 11.8 kcal $gmol^{-1}$. A nonlinear model accounting for temp. and concn. effects on the consistency coeff. was identified. The constants of the aforementioned nonlinear model were different for each wk. of storage. During the 4 wks. of storage the consistency coeff. showed no significant differences, in contrast to the flow behaviour index. AA

721

Garcia-Risco (MR), Cortes (E), Carrascosa (AV) and Lopez-Fandino (R). **Microbiological and chemical changes in high-pressure-treated milk during refrigerated storage.** *Journal of Food Protection* 61(6); 1998; 735-737

The microbiological and biochemical changes during storage of high-pressure-treated (400 MPa at 25°C, for 30 min) whole (3.5% fat) and skim (0.3% fat) milk at refrigeration temp. (7°C) were studied. From a microbiological point of view, high-pressure treatment of milk led to an increase in the shelf life because, after 45 days of refrigerated storage, the psychrotrophic and pseudomonad counts of the pressurized milk were lower than those of the unpressurized milk after 15 days. Capillary electrophoresis of the casein fraction showed that proteolysis by bacterial proteinases was not relevant in high-pressure-treated milk, as evidenced by a negligible degradation of k-casein. However, since the pressure conditions assayed did not lead to plasmin inactivation, considerable β-, α_{S2}- and α_{S1}-casein hydrolysis took place during refrigerated storage, which can be responsible for flavour defects. No significant differences were found between skim and whole high-pressure-treated milks. AA

Goat milk

722

Mehaia (MA) and El-Khadragy (SM). **Physicochemical characteristics and rennet coagulation time of ultrafiltered goat milk.** *Food Chemistry* 62(3); 1998; 257-263

Goat skim milk was conc. by ultrafiltration (UF) to vol. concn. ratios (VCR) of 2, 3, 4 and 5. Gross composition, titratable acidity, pH, nitrogen distribution, percentage retention and recovery of components and rennet coagulation time (RCT) of skim milk during UF processing were studied. During UF of goat skim milk, all fat, CN, WPN, 19% of NPN , 78.1% of TS, 78.6% of ash and 3.5% of lactose were retained in 5-VCR retentate. Recovery of these components were 14.7, 53, 48, 17 for NPN, TS, ash, lactose and 100% for fat, WPN or CN, resp. For TN, TS, ash, NPN and lactose, retention was increased by increasing the VCR. The titratable acidity was increased from an initial value of 0.14 to 0.38% in 5-VCR retentate, whereas pH decreased from 6.58 to 6.50. The RCT decreased as the protein concn.

of the milk increased, but the precise influence of protein concn. decreased at higher levels of rennet. AA

Milk products

723

Hossain (SA), Pal (PK), Sarkar (PK) and Patil (GR). **Quality of *dudh churpi* as influenced by fat level in cooking milk and cooking time of *prechurpi*.** *Journal of Food Science and Technology (India)* 36(1); 1999; 19-23

Dudh churpi, a shelf-stable traditional milk product, was prepared from the partially dried *churpi* (*prechurpi*). To determine the effect of fat level in cooking milk on the quality of *dudh churpi*, *prechurpi* was cooked for 15 min in conc. (containing 29.2% total solids) prepared from milk having 2.0% cane sugar and different levels of fat. The moisture contents of *dudh churpi* increased correspondingly with the decrease in fat level. *Dudh churpi* prepared by using the conc. prepared from milk of 1.0% fat scored best with respect to sensory quality. The cooking time of *prechurpi* in conc. of milk having this optimum fat level was standardized for the production of *dudh churpi*. The product, prepared by cooking *prechurpi* for 15 min, had the most desirable chemical composition and the highest score for all the sensory and textural parameters. AA

Butter

724

Basantia (NC) and Rai (T). **Standardization of visual Karl-Fischer titration method for moisture determination in butter.** *Journal of Food Science and Technology (India)* 36(1); 1999; 74-77

The visual Karl-Fischer titration (KFT) method for moisture detn. in butter was standardized with suitable modifications. The method employed pyridine free Karl-Fischer reagent (KFR), methanol:chloroform (1:3) as solvent and back titration technique to get comparable result with standard oven drying method. Moisture in 30 samples of table butter was analyzed by ISI oven drying and KFT methods. Results showed that statistically insignificant av. differences existed between the oven drying (OD) and KFT methods. The KFT method gave results averaging 0.173% lower than the OD method. AA

Cheese

725

Lavillonniere (F), Martin (JC), Bougnoux (P) and Sebedio (J-L). **Analysis of conjugated linoleic acid isomers and content in French cheeses.** *Journal of the American Oil Chemist's Society* 75(3): 1998; 343-352

726

Lobato-Calleros (C), Vernon-Carter (EJ), Guerrero-Legarreta (I), Soriano-Santos (J) and Escalona-Beundia (H). **Use of fat blends in cheese analogs: Influence on sensory and instrumental textural characteristics.** *Journal of Texture Studies* 28(6); 1997; 619-632

Cheese analogs were prepared with the fat fraction composed of butterfat, soybean fat or soybean oil and their blends, in accordance with an experimental design of three components. The ten resulting formulations were subjected to a texture profile instrumental analysis and sensory analysis by a quantitative ranking test. Principal Component Analysis showed that the instrumental textural characteristics of hardness and adhesiveness were negatively correlated to cohesiveness and springiness, while the sensory texture characteristic of firmness was correlated negatively with elasticity and creaminess. Soybean fat confers hardness and adhesiveness to the cheese analogs, but decreases their cohesiveness and springiness, while the opposite effect is due to soybean oil and butterfat. AA

727

Bisht (RS) and Jha (YK). **Storage stability of cheese spread from acidified milk curd.** *Journal of Food Science and Technology (India)* 36(1); 1999; 15-18

A characteristic cheese flavour was developed in coagulated curd with microbial enzymes and lactic acid bacteria during ripening at 30 plus or minus 1°C. The ripened curd was converted into cheese spread and studied for sensory, biochemical and microbiological changes during storage at 5 plus or minus 1°C. Experimental cheese spread samples had normal sensory characteristics upto 30 days. Biochemical characteristics in terms of titratable acidity %, pH, soluble nitrogen and free fatty acids (meq/100 g fat) were 0.38, 5.32, 1.74 and 69.42%, resp. after 40 days of storage, which changed

significantly ($P < 0.01$) relative to standard sample. Standard plate counts did not change significantly ($P < 0.01$), whereas yeast and mould ($P < 0.01$) and coliform counts ($P < 0.01$) changed significantly. The degree of proteolysis was evidenced by PAGE. AA

728
Quattrucci (E), Bruschi (L), Manzi (P), Aromolo (R) and Panfili (G). **Nutritional evaluation of typical and reformulated Italian cheese.** *Journal of the Science of Food and Agriculture* 73(1); 1997; 46-52

Cheddar cheese

729
Kumar (P) and Upadhyay (KG). **Compositional and textural characteristics of unripened mixed milk Cheddar cheese manufactured by half-whey salting technique.** *Journal of Food Science and Technology (India)* 36(1); 1999; 32-36

Quality of Cheddar cheese from mixed milks by half-whey salting technique was evaluated with respect to its influence on gross chemical composition, other chemical indices, yield efficiency, mineral partitioning and their retention in cheese and texture profile of unripened cheese, including relationship between mineral content and textural characteristics. Fresh experimental cheeses made from mixed milks (buffalo:cow) in 70:30 (M_1) and 60:40 (M_2) proportions had significantly improved moisture and moisture-in-non fat substances (MNFS) with concomitant reduction in salt and salt-in-moisture (SM). A significant lower pH and higher acidity, a marked depletion of total ash, Ca, but not P with concomitant lower retention of Ca and P were observed. Such changes in moisture, MNFS and mineral make-up had significant influence on hardness, brittleness, gumminess and chewiness of M_1 milk cheeses, but not in case of M_2 milk cheeses. Total ash, Ca and P contents of cheese correlated significantly to a large number of textural characteristics. On the other hand, half-whey salting had no marked influence on fat, fat-on-dry matter (FDM), protein (except M_2 cheese), yield (except M_2 cheese) and recovery of milk constituents in cheese as well as proteolytic and lipolytic indices. Beneficial effect of admixing of cow's milk in higher proportion (60:40) was also noticed on moisture retention and texture characteristics. AA

Mozzarella cheese

730
Subramanian (R) and Gunasekaran (S). **Small amplitude oscillatory shear studies on Mozzarella cheese: Part II. Relaxation spectrum.** *Journal of Texture Studies* 28(6); 1997; 643-656

The frequency dispersion of dynamic mechanical spectra of a low-moisture, part-skim and a low-fat, part-skim Mozzarella cheese are presented. Small amplitude oscillatory shear measurements within the linear viscoelastic range (0.05% strain) were made over 12 wks. of storage. Proteolysis during storage led to softening of the cheeses and thus decreases in storage (G') and loss (G") moduli. Master curves (at a reference temp. of 40°C) were obtained by shifting the temp.-dependent frequency dispersion of storage modulus. There was no significant change in G' after 4 wks. of aging. The variation of relaxation time and viscosity spectrum of both cheeses with age were obtained from the master curves using the generalized Maxwell model and nonlinear regression analysis. With maturation the viscosity distribution of corresponding Maxwell elements shifted towards smaller values, indicating that cheeses become softer and melt more easily. AA

731
Subramanian (R) and Gunasekaran (S). **Small amplitude oscillatory shear studies on Mozzarella cheese: Part I. Region of linear viscoelasticity.** *Journal of Texture Studies* 28(6); 1997; 633-642

Changes in texture of a low-moisture, part-skim and a low-fat, part-skim Mozzarella cheese during heating were examined by measuring their rheological properties using small amplitude oscillatory shear (SAOS) tests after 1, 4 and 12 wks. of refrigerated storage. In general, the linear viscoelastic range decreases with increasing temp. and age because cheese behaves more like a viscoelastic solid at lower temp. and shorter ripening time. The dynamic rheological properties (γ°, G' and G") were constant within a range of 0.05% shear strain. The dynamic rheological properties of low-fat, part-skim Mozzarella were found to be higher than that of low-moisture, part-skim Mozzarella within the linear viscoelastic range. AA

Paneer

732

Rao (KJ) and Patil (GR). **Development of ready-to-eat paneer curry by hurdle technology.** *Journal of Food Science and Technology (India)* 36(1); 1999; 37-41

A paneer-based convenience food (paneer curry) was developed using hurdle technology. The product was so formulated as to have a a_w of 0.95, pH 5.0, potassium sorbate 0.1% and processed at F-value of 0.8 in tins. The changes in rheological properties of paneer portion as well as chemical and sensory changes during storage at 30°C were studied. The product kept well for about one month and was found to have better quality than the heat-sterilised (15.0 F-value) product stored under similar conditions. AA

Rasmalai

733

Tiwari (RPGrewalJS). **Studies on the effect of preservatives on the keeping quality of rasmalai.** *Journal of Food Science and Technology (India)* 36(1); 1999; 84-87

The post-processing development of contaminating microorganisms present in rasmalai were controlled effectively with the addition of low concn. (100-200ppm) of selected preservatives like butylated hydroxyanisole (BHA), butylated hydroxy toluene (BHT) and lauricidin (LC). Rasmalai samples containing these preservatives showed significant decrease in viable count as compared to control (no preservative) and slight variation in pH was seen on storage at 4°C, room temp. 22-25°C or at 37°C for 1-10 days. AA

Whey proteins

734

Ju (ZY) and Kilara (A). **Textural properties of cold-set gels induced from heat-denatured whey protein isolates.** *Journal of Food Science* 63(2); 1998; 288-292

A 9% whey protein (WP) isolate sol. at pH 7.0 was heat-denatured at 80°C for 30 min. Size-exclusion HPLC showed that native WP formed soluble aggregates after heat-treatment. Additions of $CaCl_2$ (10-40 mM), NaCl (50-400 mM) or glucono-delta-lactone (GDL, 0.4-2.0%, w/v) or hydrolysis by a protease from *Bacillus licheniformis* caused gelation of the denatured sol. at 45°C. Textural parameters, hardness, adhesiveness, and cohesiveness of the gels so formed changed markedly with concn. of added salts or pH by added GDL. Max. gel hardness occurred at 200 mM NaCl or pH 4.7. Increasing $CaCl_2$ concn. continuously increased gel hardness. Generally, GDL-induced gels were harder than salt-induced gels, and much harder than the protease-induced gel. AA

735

Miller (KS), Upadhyaya (SK) and Krochta (JM). **Permeability of d-limonene in whey protein films.** *Journal of Food Science* 63(2); 1998; 244-247

The effects of temp., relative humidity (%RH) and permeant concn. on aroma permeability were investigated in edible whey protein isolate (WPI) films. An orthogonal regression was performed to ascertain significance of these factors. Temp. and %RH had exponential effects on d-limonene permeability, interacting synergistically to influence aroma transport in WPI polymer films. Permeability of d-limonene in WPI polymer films was not influenced by permeant concn. in the range 62 to 226 ppm (mol/mol). The predictive equation generated by regression analysis could be potentially useful for edible packaging design within the given temp., %RH, and concn. ranges. The Arrhenius-type format also provided insight into the temp.-sensitivity of WPI films and confirmation of the influence of %RH on permeability activation energy. AA

736

Yildirim (M) and Hettiarachchy (NS). **Properties of films produced by cross-linking whey proteins and 11S globulin using transglutaminase.** *Journal of Food Science* 63(2); 1998; 248-252

Transglutaminase (TG) was used to produce films from whey protein isolate, soybean 11S globulin and a mixture of the two (1:1, wt./wt.). Solubility of TG cross-linked films was lower than that of control films at pH 3, 4, 6 and 8. Solubility of control films in 6.6 M urea and in 10% SDS was higher than that of TG cross-linked films. Hydrolysis of control and TG cross-linked films by trypsin and α-chymotrypsin was similar after 24 h incubation. Mean thickness of films ranged from 69 to 77 μm and there were no differences among thicknesses. Av. tensile strength

values of TG cross-linked films were two times greater than those of the homologous controls. AA

Yoghurts

737
Schmidt (KA), Kim (J) and Jeon (IJ). **Composition of carbohydrates and concentration of β-galactosidase of commercial frozen yoghurt.** *Journal of Food Quality* 20(5); 1997; 349-358

Commercial frozen yoghurt samples were analyzed for composition, β-galactosidase activity, and microbial quality. The composition of protein, fat, sugars, other carbohydrates, and total solids varied considerably among the 11 brands tested. All samples contained high levels of lactic acid bacteria (LAB) (6.0 log cfu/mL), as well as active β-galactosidase but the enzymatic activity varied greatly (1.04-43.12 ONP units) among samples. A significant correlation (r = 0.785) existed between β-galactosidase and LAB concn. The major sugars in samples were sucrose (0-12.7%) followed by lactose (2.31-4.25%) and glucose (0.74-2.49%). The sugar extraction method developed for the HPLC analysis gave reliable and reproducible data, despite the fact that frozen yoghurt samples contained a wide variation in fat, protein, and total solids contents. AA

MEAT AND POULTRY

Meat

738
Carr (MA), Miller (MF), Daniel (DR), Yarbrough (CE), Petrosky (JD), Thompson (LD). **Evaluation of the physical, chemical and sensory properties of jerky processed from emu, beef, and turkey.** *Journal of Food Quality* 20(5); 1997; 419-425

739
Morita (H), Sakata (R) and Nagata (Y). **Nitric oxide complex of iron(II) myoglobin converted from metmyoglobin by *Staphylococcus xylosus*.** *Journal of Food Science* 63(2); 1998; 352-355

Beef

740
Zhao (Y), Flores (RA) and Olson (DG). **High hydrostatic pressure effects on rapid thawing of frozen beef.** *Journal of Food Science* 63(2); 1998; 272-275

741
Wang (B) and Xiong (YL). **Functional stability of antioxidant-washed, cryoprotectant-treated beef heart surimi during frozen storage.** *Journal of Food Science* 63(2); 1998; 293-298

742
Juven (BJ), Barefoot (SF), Pierson (MD), McCaskill (LH) and Smith (B). **Growth and survival of *Listeria monocytogenes* in vacuum-packaged ground beef inoculated with *Lactobacillus alimentarius* FloraCarn L-2.** *Journal of Food Protection* 61(5); 1998; 551-556

743
Podolak (RK), Setser (CS), Kastner (CL) and Zayas (JF). **Aroma, colour, and texture of ground beef patties treated with fumaric and lactic acids.** *Journal of Food Quality* 20(6); 1997; 513-524

744
Sen (AR) and Sharma (N). **Effect of freeze-thaw cycles during storage on quality of meat and liver of buffalo.** *Journal of Food Science and Technology (India)* 36(1); 1999; 28-31

745
Delazari (I), Iaria (ST), Riemann (HP), Cliver (DO) and Mori (T). **Decontaminating beef for *Escherichia coli* O157:H7.** *Journal of Food Protection* 61(5); 1998; 547-550

746
Nutsch (AL), Phebus (RK), Riemann (MJ), Kotrola (JS), Wilson (RC), Boyer (JE), Brown (TL). **Steam pasteurization of commercially slaughtered beef carcasses: Evaluation of bacterial populations at five anatomical locations.** *Journal of Food Protection* 61(5); 1998; 571-577

Pork

747

Rao (VK), Kowale (BN), Babu (NP) and Bisht (GS). **Lipid oxidation and development of cholesterol oxides in pork during cooking and storage.** *Journal of Food Science and Technology (India)* 36(1); 1999; 24-27

748

Sprouls (GK) and Brewer (MS). **α-Tocopherol effects on colour and sensory characteristics of ground pork during retail display.** *Journal of Food Quality* 20(6); 1997; 501-511

749

Chen (F-C), Hsieh (Y-HP) and Bridgman (RC). **Monoclonal antibodies to porcine thermal-stable muscle protein for detection of pork in raw and cooked meats.** *Journal of Food Science* 63(2); 1998; 201-205

750

Roth (DM), Mckeith (FK) and Brewer (MS). **Processing parameter effects on textural characteristics of reduced-fat pork sausage.** *Journal of Food Quality* 20(6); 1997; 567-574

751

Tyszkiewicz (I), Klossowska (BM), Wieczorek (U) and Jakubiec-Puka (A). **Mechanical tenderization of pork meat: Protein and water release due to tissue damage.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 179-185

Products

752

Fiddler (W), Pensabene (JW), Gates (RA) and Adam (R). **Nitrosamine formation in processed hams as related to reformulated elastic rubber netting.** *Journal of Food Science* 63(2); 1998; 276-278

753

Kondjoyan (A) and Daudin (JD). **Optimisation of air-flow conditions during the chilling and storage of carcasses and meat products.** *Journal of Food Engineering* 34(3); 1997; 243-258

In the meat industry investment and running costs for chillers are determined mainly by the chilling time and the wt. losses associated with chilling or storage The aim of this study was to assess the consequences of the spatial heterogeneity of air-flow properties in rooms and to optimise the multi-stage low air temp. chilling process used to reduce wt. losses. The calculations which provide the chilling kinetics of either pork carcasses or cylinders were performed using a mathematical model which had already been tested, and with air/product transfer coeff. which had been measured independently for various air velocities and turbulence intensities. The results show the relative effect of product thickness and air-flow properties under practical conditions and indicate the limits of low air temp. chilling tunnels. They also suggest that if a homogeneous low velocity, low turbulence intensity air flow could be controlled in chillers, then the air temp could be very low thus reducing wt. losses dramatically. AA

754

Funami (T), Yada (H) and Nakao (Y). **Curdlan properties for application in fat mimetics for meat products.** *Journal of Food Science* 63(2); 1998; 283-287

Gelling characteristics and viscoelastic properties of aqueous suspensions of curdlan were investigated by dynamic viscoelasticity measurements. The mechanical spectrum of the suspension was similar to that of weak gels, suggesting the suspension has a well-regulated particle-alignment with yield stress. Curdlan reached the highest moisture absorption rate within the temp. range in which the most significant moisture loss of meat occurs. These results suggest that curdlan could be an effective main ingredient in fat mimetics for meat products. Nonfat sausages using the curdlan-based fat mimetics were prepared and evaluated by a creep test and indicated curdlan was effective as a fat replacer in such systems. AA

Poultry

Chickens

755

Chen (H) and Marks (BP). **Visible/near-infrared spectroscopy for physical characteristics of cooked chicken patties.** *Journal of Food Science* 63(2); 1998; 279-282

Near infrared spectroscopy (NIR) methods were developed for evaluating the physical characteristics of chicken patties, after various degrees of cooking. The changes in physical characteristics of chicken patties were related to the thermal history in convection cooking and visible/NIR calibrations were evaluated for physical characteristics of cooked patties. Cooking loss and yield deformation were related (R = 0.91 and -0.76 resp.) to the integrated time-temp. history. Visible NIR caliberations were developed and validated for the physical characteristics. Among the tested properties, visible/NIR spectroscopy was most accurate in predicting cooking loss and yield force. Standard errors of prediction were 7.9 and 8.2% of the corresponding property range among samples. GS

756

Fernandez (P), Cofrades (S), Solas (MT), Carballo (J) and Colmenero (FJ). **High pressure-cooking of chicken meat batters with starch, egg white, and iota carrageenan.** *Journal of Food Science* 63(2); 1998; 267-271

The effects of applying high pressure (200 and 400 MPa) with cooking at 70°C on the properties of chicken gels were assessed; the influence by the addition of corn starch (CS), egg white (EW) and iota-carrageenan (IC) was also determined. High pressure/cooking combinations of chicken gels caused the formation of less compact and aggregated microstructures, which had better binding properties and were less hard. Pressurising caused a general decrease in colour parameters. The addition of starch, EW or IC increased water binding, of meat batters. Starch and IC, also caused increase in hardness and chewiness of meat batters. Results indicate that high pressure influenced the action of the ingredients and the extent of the effect was related to the type of ingredient and the pressure level, but pressure level clearly predominated over ingredient effects. GS

757

Kanatt (SR), Paul (P), D'Souza (SF) and Thomas (P). **Lipid peroxidation in chicken meat during chilled storage as affected by antioxidants combined with low-dose γ-irradiation.** *Journal of Food Science* 63(2); 1998; 198-200

TBA values and carbonyl content for irradiated samples of ground chicken meat were higher than for nonirradiated samples. Addition of antioxidants tocopherol (natural) or BHT (synthetic) resulted in retardation of oxidative rancidity ($P < 0.05$). Meat treated with antioxidants prior to irradiation had lower TBA values as compared to untreated irradiated counterparts. Free fatty acid (FFA) values decreased after irradiation. Addition of antioxidants prior to irradiation showed a synergistic effect in decreasing FFA content. TLC of muscle lipids indicated a reduction in the triacylglycerols content with concomitant increases in FFA of all samples during storage. All irradiated meats were acceptable for consumption up to 4 wk. of storage. AA

758

Chiu (CP), Yang (DY) and Chen (BH). **Formation of heterocyclic amines in cooked chicken legs.** *Journal of Food Protection* 61(6); 1998; 712-719

The effects of frying and microwave cooking on generation of heterocyclic amines (HAs) in chicken legs with skin and without skin were studied. Chicken legs were microwave-cooked at 2,450 MHz for 5, 10 and 15 min with an output power of 700 W. Frying of chicken legs was conducted at 100 and 150°C for 15 min and at 200°C for 5, 10 and 15 min. The various HAs were analyzed by HPLC with diode-array detection. Results showed that both the var. and contents of HAs and the wt. losses of chicken legs increased along with increasing cooking temp. and time. With skin both the amounts of HAs and wt. losses of chicken legs were less than those without skin under the same heating conditions. The wt. losses of microwave-cooked chicken legs were higher than those of fried chicken legs. The formation of the aminomethylimidazo quinoline type of HAs could be reduced by choosing microwave cooking in place of frying. Frying led to the formation of both the aminomethylimidazo quinoline and the carboline types of HAs. AA

Broilers

759

Anon. **Fluorometric determination of acid phosphatase in cooked, boneless, nonbreaded broiler breast and thigh meat.** *Journal of AOAC International* 81(4); 1998; 887-906

Turkeys

760

Chang (HC), Carpenter (JA) and Toledo (RT). **Modeling heat transfer during oven roasting of unstuffed turkeys.** *Journal of Food Sclence* 63(2); 1998; 257-261

A finite element method was used to solve the unsteady state heat transfer equations for heating of turkeys in a conventional electric oven. Breast, and thigh and wing joint temp. in 5.9, 6.8, 8.6, 9.5 and 10.4 kg turkeys were simulated. A surface heat transfer coeff. of 19.252 W/m^2K determined by transient temp. measurements in the same oven, was used. Thermal conductivity measured using a line heat source probe from 0 to 80°C was 0.464 W/mK. Simulated temp. were within 1.33, 1.47 and 1.22°C of experimental values of temp. in the breast, thigh, and wing joint, resp. Initial temp. 1, 2 and 3°C lower than 4°C required additional baking time of 16, 22 and 27 min, resp. for the thigh joint to reach the target endpoint temp. AA

761

Chang (HC), Carpenter (JA) and Toledo (RT). **Temperature histories at critical points and recommended cooking time for whole turkeys baked in a conventional oven.** *Journal of Food Science* 63(2); 1998; 262-266

Time-temp. histories and cooking times were determined for turkeys baked at 162.8°C from 4.44°C to an endpoint of 82.2°C in the thigh joint or breast. Turkeys (128) in five wt. classes from 5.9 to 10.8 kg (0.9 kg increments) were equally divided into fresh, frozen, stuffed, unstuffed, and cooked shielded or unshielded groups. The slowest heating point was either the wing joint or stuffing geometric center. Cooking time for unshielded turkeys was 155 min plus 11 min/kg, unstuffed, and 200 min plus 8.8 min/kg, stuffed. Median cooking loss was 23%. Shielding of breasts prolonged cooking time. The cooking endpoint of 82.2°C in the thigh joint provided adequate lethality against *Salmonella* in the slowest heating points of both stuffed and unstuffed birds. AA

Fish

762

Valle (M), Malle (P) and Bouquelet (S). **Evaluation of fish decomposition by liquid chromatographic assay of ATP degradation products.** *Journal of AOAC International* 81(3); 1998; 571-576

A liquid chromatographic method is described for quantitative detn. of nucleotide derivatives adenosine 5'-triphosphate, adenosine 5'-diphosphate, adenosine 5'-monophosphate, inosine 5'-monophosphate, inosine, and hypoxanthine in fish. The nucleotide derivatives are extracted by grinding the flesh in cold perchloric acid, recovered, precipitated from the acid by 5M KOH, and analyzed. Nucleotide derivatives and internal standard (purine) were separated in 14 min with a new elution gradient on a reversed-phase column (Kromasil C_{18}) at 25°C. The column was regenerated in 20 min. Regression lines gave strong correlation coeff. This new method is fast, accurate, and more objective than the Fresh-Tester, acolorimetric detn. of a ratio K used to measure freshness. It shows that the ratio K cannot be used as a universal measure of fish decomposition. AA

Albacore

763

Ben-Gigirey (B), Sousa (JMVBD), Villa (TG) and Barros-Velazquez (J). **Changes in biogenic amines and microbiological analysis in albacore (*Thunnus alalunga*) muscle during frozen storage.** *Journal of Food Protection* 61(5); 1998; 608-615

Albacore specimens of extra quality were analyzed for their biogenic amine contents after 1, 3, 6 and 9 months of frozen storage at -18°C or -25°C. A HPLC method involving a linear elution gradient was optimized for the identification and detn. of putrescine, cadaverine, histamine, spermidine, and spermine in albacore tuna. Putrescine was the biogenic amine that showed the highest increase, reaching concn. of 59.04 ppm (815% of the initial level) and 68.26 ppm (942% of the initial level) in the white muscle of albacore after 9 months of frozen storage at -18 and -25°C, resp. Cadaverine,

histamine, and spermidine concn. were below 3, 5, and 11 ppm, resp., after 9 months of frozen storage, while spermidine underwent a significant decrease at both storage temp. Microbiological analysis confirmed the absence of sp. of *Enterobacteriaceae* in 75% of the albacore specimens after 9 months of frozen storage; coliforms were always below 3 cfu/g. The survival rate of the psychrotrophic microorganisms after 9 months of frozen storage at -25°C was 4.6%, while 38.9 and 92.1% of the aerobic mesophiles present in the white muscle of albacore before freezing survived 9 months of storage at -18 and -25°C, resp. AA

764

Ben-Gigirey (B), Craven (C) and An (H). **Histamine formation in albacore muscle analyzed by AOAC and enzymatic methods.** *Journal of Food Science* 63(2); 1998; 210-214

Histamine levels in albacore (white tuna) muscle were measured by both AOAC fluorometric method and enzymatic method to compare sensitivity and accuracy. Histamine level was not affected by on-board handling techniques studied i.e. bleeding and spiking. Enzymatic results showed a good correlation with those of the AOAC method (r^2 = 0.829). Enzymatic method which tends to overestimate histamine at levels < 1 mg/100 g was rapid, simple and hence recommended for analysis of tuna. GS

Cod

765

Meacock (G), Taylor (KDA), Knowles (MJ) and Himonides (A). **The improved whitening of minced cod flesh using dispersed titanium dioxide.** *Journal of the Science of Food and Agriculture* 73(2); 1997; 221-225

A simple effective method of whitening fish mince (FM) using titanium dioxide (TiO_2) has been developed. The whitener comprised a dispersed TiO_2 suspension stabilised with xanthan gum (XG, 20 g TiO_2/1 g XG/79 ml water) which produced significant whitening of FM derived from cod waste. The whitener was incorporated during the mixing stage of conventional FM manufacture, and achieved an even spread of coloration. The whitened FM was found to be stable to high temp. cooking systems, such as frying. Taste and texture of the FM were not affected by the level of XG and TiO_2 used. XG and TiO_2 were sufficiently heat stable and inert with respect to taste, odour and chemical reactivity, to be suitable for use for such a purpose, unlike other compounds investigated and conventional dispersed fat/oil whiteners. A level of 1 g kg^{-1} of TiO_2 in the FM was found to give optimal level. AA

Flatfish

766

Cespedes (A), Garcia (T), Carrera (E), Gonzalez (I), Sanz (B), Hernandez (PE), Martin (R). **Identification of flatfish species using polymerase chain reaction (PCR) amplification and restriction analysis of the cytochrome b gene.** *Journal of Food Science* 63(2); 1998; 206-209

Restriction site analysis of PCR products from a conserved region of the cytochrome b gene has been used for the specific identification of sole (*Solea solea*), European plaice (*Pleuronectes platessa*) and flounder (*Platichthys flesus*). PCR amplification of the cytochrome b gene using universal primers produced a 359 bp fragment in all species analyzed. Digestion of the PCR products with NciI, Sau3AI and HinfI endonucleases, followed by agarose gel electrophoresis of the digested PCR products, yielded specific profiles that enabled direct identification of the fish sp. This methodology should prove useful for enforcing labeling regulations in the authentication of flatfish sp. AA

Salmon

767

Himelbloom (BH) and Crapo (CA). **Factors influencing the microbial quality of cold-smoked salmon strips.** *Journal of Food Science* 63(2); 1998; 356-358

Microbiological changes during smoking and drying salmon strips using Alaska Native subsistence processing methods were determined. Chum salmon strips handled with or without gloves were brined, smoked and dried at ambient temp. in two smokers (manual and automated). Waterphase salt increased from 2% to 12% and a_w decreased from 0.98 to 0.85 during smoking and drying. Aerobic plate counts increased from 10^3/g to 10^7/g while coliform counts increased to 10^5/g in strips from the manual smoker as a result of airborne contamination. Strips handled without gloves

contained 10^5 *Staphylococcus aureus*/g. Sanitary handling and air quality control will enhance seafood safety while maintaining product quality attributes. AA

768

Lin (TM) and Park (JW). **Solubility of salmon myosin as affected by conformational changes at various ionic strengths and pH.** *Journal of Food Science* 63(2); 1998; 215-218

The relationship between solubility and conformational changes of salmon (*Oncorhynchus tshawytscha*) myofibrillar proteins at various ionic strengths and pH was investigated using myosin as a model system. Solubility of myosin increased with increased KCl concn. up to 0.5 M. Further increasing salt concn. resulted in a gradually reduced solubility. In the absence of salt, myosin was slightly soluble at pH >7 or < 4. The increased solubility correlated with the increased surface hydrophobicity and relative sulphydryl content as well as the decreased α-helicity. At KCl > 1.0 M, myosin regained its helix structure with a concomitant loss of solubility due to the dominant hydrophobic interaction among nonpolar amino acid residues. AA

769

Himelbloom (BH) and Crapo (CA). **Microbial evaluation of Alaska salmon caviar.** *Journal of Food Protection* 61(5); 1998; 626-628

Microbial quality of pink salmon caviar (ikura) processed at one plant in Alaska during a 30 day season was examined. Ikura (a_w = 0.98; pH 6.1) averaged 49% water, 32% protein, 11% fat, 7% ash, and 3% salt. Aerobic plate counts (APCs) ranged from < 10^2/g to 4.5 x 10^7/g with increasing APC toward season's end. Coliform counts ranged from < 3/g to 2.4 x 10^3g. *Escherichia coli*, *Staphylococcus aureus*, yeasts and molds were not detected. High-APC (10^7/g) thawed caviar exhibited predominantly lactic acid bacteria; low-APC (10^3/g) thawed caviar exhibited predominantly gram-negative bacteria. Freezing had little effect on the microbial counts, and shelf-life of thawed caviar was 3 to 5 days at 2°C. AA

770

Bouraoui (MM), Fichtali (J), Pinder (KL), Nakai (S) and Bowen (BD). **Viscous properties of salmon surimi paste.** *Journal of Food Engineering* 34(4); 1997; 441-452

A rotational viscometer was used to study the viscous properties of a paste composed of salmon surimi, salt, whey protein conc., wheat starch and water. Rheograms measured after an initial shearing period of 10 min were well fitted by the Herschel-Bulkley model and by the Casson model. The paste behaved as a shear thinning fluid with a yield stress that increased with temp. up to 21°C. Shear stress also increased with temp. up to 21°C, possibly because of protein-protein interactions. The rheological data were reasonably well represented by a simple new model which takes into consideration the effects of both shear rate and temp. Shear stress, predicted by this model, increased with increasing shear rate and temp. AA

Trout

771

Lefevre (F), Fauconneau (B), Ouali (A) and Culioli (J). **Thermal gelation of brown trout myofibrils: Effect of muscle type, heating rate and protein concentration.** *Journal of Food Science* 63(2); 1998; 299-304

The thermal gelation properties of myofibril sol. (KCl 0.6 M; pH 6.0) from reared brown trout white and red muscles were analyzed by thermal scanning rheometry. With a heating rate of 1°C/min, red muscle myofibrils exhibited a lower gelation capacity than white muscle myofibrils at low temp. No difference was observed above 60°C where solid gels were formed from the 2 myofibril types. Increasing protein concn. or reducing heating rate increased the values of the rheological parameters at 80°C for the 2 muscle type myofibrils. With a low heating rate (0.25°C/min), while muscle myofibrils formed stronger gels whatever the temp. AA

Tuna

772

Saito (H), Ishihara (K) and Murase (T). **The fatty acid composition in tuna (Bonito, *Euthynnus pelamis*) caught at three different localities from tropics to temperate.** *Journal of the Science of Food and Agriculture* 73(1); 1997; 53-59

Products

Surimi

773
Lyver (A), Smith (JP), Nattress (FM), Austin (JW) and Blanchfield (B). **Challenge studies with *Clostridium botulinum* type E in a value-added surimi product stored under a modified atmosphere.** *Journal of Food Safety* 18(1); 1998; 1-23

Challenge studies were carried out on raw, cooked, and sterilized surimi nuggets, inoculated with 10^4 spores/g of *C. botulinum* type E spores. All products were packaged in air and air with an Ageless SS oxygen absorbent and stored at 4, 12 and 25°C. Toxin was not detected in any raw product throughout storage (28 days). The absence of toxigenesis was attributed to the low pH (4.1-4.3) due mainly to the growth of lactic acid bacteria (10 cfu/g). Toxin was also not detected in any cooked product after 28 days. Product pH did not decrease as previously (due to the absence of LAB), but counts of *C. botulinum* still decreased throughout storage. In sterile nuggets, *C. botulinum* counts increased to 10^6 cfu/g at both 12 and 25°C, resp., by 28 days. Lactic acid bacteria and *Bacillus* spp. were not detected throughout the 28 days storage period. Toxin was detected by days 28 and 14 at 12 and 25°C, resp., and toxigenesis preceded spoilage. The absence of toxin in cooked nuggets was attributed to the anti-botulinal role by *Bacillus* sp., the predominant spoilage bacteria in cooked nuggets. AA

PROTEIN FOODS

774
Chase (GW), Long (AR) and Eitenmiller (RR). **Liquid chromatographic method for analysis of all-rac-α-tocopheryl acetate and retinyl palmitate in soy-based infant formula using a zero-control reference material (ZRM) as a method development tool.** *Journal of AOAC International* 81(3); 1998; 577-581

A liquid chromatographic method is described for analysis of all-rac-α-tocopheryl acetate, tocopherols, and retinyl palmitate in soy-based infant formula. The vitamins are extracted in isopropyl alcohol and hexane-ethyl acetate without saponification and quantitated by normal-phase chromatography with fluorescence detection. All-rac-α-tocopheryl acetate and retinyl palmitate are quantitated isocratically with mobile phases of 0.5% (v/v) and 0.125% (v/v) isopropyl alcohol in hexane, resp. Recoveries from zero control reference material soy-based formula averaged 97.2% (n = 25) for retinyl palmitate and 100% (n = 25) for all-rac-α-tocopheryl acetate. Coeff. of variation ranged from 1.21 to 2.86% for retinyl palmitate and from 1.49 to 5.16% for all-rac-α-tocopheryl acetate. The method provides a rapid, specific, and easily controlled assay for analysis of vitamin A and vitamin E in fortified infant formula. Additionally, the method eliminates use of chlorinated solvents. AA

ALCOHOLIC AND NON-ALCOHOLIC BEVERAGES

775
Karlsson (HOE) and Tragardh (G). **Aroma recovery during beverage processing.** *Journal of Food Engineering* 34(2); 1997; 159-178

During beverage processing the aroma composition of the beverage can be seriously altered. This can be due to chemical reactions modifying the aromas or to physical losses. In many cases these changes are unwanted. A possible way of minimizing the changes is to use various separation techniques for the recovery of the aromas. Techniques suitable for this task, both commercially available and developing, are distillation, partial condensation, gas injection techniques, pervaporation, adsorption and supercritical fluid extraction. The fundamental background to these processes and their performance and suitability for aroma recovery is reviewed in this study. AA

Alcoholic beverages

Beer

776
Pilkington (PH), Margaritis (A), Mensour (NA) and Russell (I). **Fundamentals of immobilised yeast cells for continuous beer fermentation: A review.** *Journal of the Institute of Brewing* 104(1); 1998; 19-31

Recent fundamental research conducted on immobilised cells with a focus on continuous primary beer fermentation is presented in this review. The knowledge of whole-cell immobilisation, continuous fermentation, yeast biochemistry associated with beer flavour production and bioreactor engineering design is required to apply immobilised yeast cells for industrial scale beer production. Understanding how immobilisation and continuous bioreactor operation affect yeast cell metabolism and viability will provide the groundwork for optimising beer quality. The latest studies on immobilised cell carriers, viability, vitality, mass transfer characteristics and bioreactor design indicate that an industrial scale immobilised cell system for primary beer fermentation may soon be a reality in the modern brewery. AA

777

Guldfeldt (LU) and Arneborg (N). **The effect of yeast trehalose content at pitching on fermentation performance during brewing fermentations.** *Journal of the Institute of Brewing* 104(1); 1998; 37-39

The effect of yeast trehalose content at pitching on the fermentation performance during brewing fermentations was studied using a commercial strain of lager yeast. *Saccharomyces cerevisiae* (AJL 2155). Pitching yeasts with different trehalose contents were obtained by collecting cells in suspension after 96 h and 144 h of fermentation in EBC tubes in 10.8°P brewers wort at 14°C. The trehalose content of the pitching yeast had no effect on growth, specific gravity and ethanol production during the subsequent fermentation. A high trehalose content of the pitching yeast, however, sustained cell viability during the initial stage of fermentation, increased the carbohydrate utilisation rate and increased the production of isoamyl alcohol and isobutanol. For these aspects of fermentation performance, the trehalose content of the pitching yeast may prove useful in evaluating the vitality of pitching yeasts within the brewery. AA

Wines

778

Uzochukwu (SVA), Balogh (E), Tucknott (O), Lewis (MJ) and Ngoddy (PO). **Volatiles of palm wine using solvent extracts.** *Journal of Food Quality* 20(6); 1997; 483-494

Solvent extracts of palm wine early in fermentation (12% sugar, pH 7), during active or mid fermentation (6% sugar, pH 3.6) and towards the end of fermentation (2% sugar, pH 3.6) were obtained using dichloromethane and diethyl ether. The extracts were analyzed by GC and GC-MS. Altogether, 73 compounds were identified, 45 of which had not been previously reported in palm wine. The qualitative and quantitative differences between the chromatograms of extracts of palm wine early in fermentation and at mid fermentation suggest tha the flavour volatiles of palm wine derive mainly from fermentation. The occurrence of acetic acid early in the fermentation suggests that it is the first volatile acid and in fact one of the first volatiles produced in palm wine fermentation, contrary to previous assumptions. The lactic fermentation, reported to initiate palm wine fermentation, is thought to be responsible for this. That fermentation must therefore be prevented in palm exudates destined to be used for any product where acetic acid is undesirable. AA

Non-alcoholic beverages

Fruit juices

Apple juices

779

Sancho (MF), Rao (MA) and Downing (DL). **Infinite dilution activity coefficients of apple juice aroma compounds.** *Journal of Food Engineering* 34(2); 1997; 145-158

An apparatus based on the inert gas stripping method was assembled for measuring infinite dilution activity coeff., $\gamma^{infinity}$, of 15 apple juice aroma compounds in aqueous sol. Values were estimated using the UNIFAC model and compared with experimental results; differences ranged from -80 to 118% with an av. of 48% for the absolute values of the differences. Values predicted with recent UNIFAC parameters were in better agreement with experimental results than those obtained using original parameters. The effect of temp. on $\gamma^{infinity}$ and relative volatility of ethyl acetate and acetone was also studied. Measurements were conducted for esters in sol. containing different levels of ethanol. A decrease in $\gamma^{infinity}$ with increasing ethanol concn. was observed for esters in sol. containing ethanol, especially at mole fractions > 10^{-2}. AA

Citrus juices

780
Jamin (E), Gonzalez (J), Bengoechea (I), Kerneur (G), Remaud (G), Naulet (N), Martin (GG). **Measurement of $^{13}C/^{12}C$ ratios of sugars, malic acid, and citric acid as authenticity probes of citrus juices and concentrates.** *Journal of AOAC International* 81(3); 1998; 604-609

The carbon-13 content of sugars, malic acid, and citric acid has been determined in authentic orange, lemon and tangerine juices. After a cleanup step, sugars and organic acids were separated from each other by an anion-exchange process, and pure malic and citric acids were isolated by preparative reversed-phase liquid chromatography. This method has been applied to the stable isotope analysis of citrus juice samples of different botanical and geographical origins and of different yrs. Correlations between the carbon isotope ratios of all metabolites have been found, and typical ranges for the differences in $\delta^{13}C$ values between them have been defined for each fruit. These data provide new tools for detecting adulterations that cannot be detected by the conventional carbon-13 method with the whole juice. AA

Mango juices

781
Ejechi (BO), Souzey (JA) and Akpomedaye (DE). **Microbial stability of mango (*Mangifera indica* L.) juice preserved by combined application of mild heat and extracts of two tropical spices.** *Journal of Food Protection* 61(6); 1998; 725-727

The microbial stability of mango (*Mangifera indica* L.) juice (pH 4.9) supplemented with extracts of ginger (*Zingiber officinale*) and nutmeg (*Myristica fragrans*) was investigated during 3 months of ambient-temp. storage. Heating at 55°C for 15 min markedly reduced the levels of non-spore-forming bacteria and produced a product with acceptable taste. Supplementing mango juice with an agueous extract of ginger (15%, vol./vol.) or nutmeg (20%, vol./vol.) inhibited the growth of challenge microorganisms; but produced a product with unacceptable taste. Heating the mango juice at 55°C for 15 min and supplementing with nutmeg (4%, vol./vol.) and ginger (4%, vol./vol.) markedly inhibited microbial growth and produced a product with acceptable taste. Tropical spices may prove useful in preservation of fruit juices by Hurdle technology. AA

Orange juices

782
Cameron (RG), Baker (RA) and Grohmann (K). **Multiple forms of pectinmethylesterase from citrus peel and their effects on juice cloud stability.** *Journal of Food Science* 63(2); 1998; 253-256

The number of pectinmethylesterase (PME) forms present in the dialysis supernatant (DS) fraction of *Citrus sinensis* (L.) Osb. var. Valencia fruit peel tissue extracts were estimated and the effects of each PME form on juice cloud stability were determined. Four peaks (forms) of PME (1, 2, 3 and 4) were identified in peel DS; and 3 of the 4 (PME 1, 2 and 3) destabilized orange juice cloud within 10 days at 30°C. PME 1 caused the most rapid cloud loss (3d), followed by PME 3 and PME 2. At 4°C PME 3 caused the most rapid cloud loss (5d), followed by PME 1 (14d) and PME 2 (14d). PME4 had no effect on juice cloud stability after 10 days at 30°C or 14 days at 4°C. BV

783
Parish (ME). **High pressure inactivation of *Saccharomyces cerevisiae*, endogenous microflora and pectinmethylesterase in orange juice.** *Journal of Food Safety* 18(1); 1998; 57-65

Decimal reduction times (D-values) for *Saccharomyces cerevisiae* ascospores inoculated into pasteurized orange juice ranged from 4 to 76 s at pressures between 500 and 350 MPa. At the same pressures, D-values of *S. cerevisiae* vegetative cells ranged from 1 to 38 s while those for the native microflora in nonpasteurized Hamlin orange juice were between 3 and 74 s. Corresponding z-values were 123, 106 and 103 MPa for ascospores, vegetative cells and native microflora, resp. Native microorganisms that survived high pressure treatments included yeasts, gram-positive and gram-negative bacilli. Pectinmethylesterase activity in nonpasteurized Hamlin orange juice was reduced to 5% of initial activity after 30 s at 900 MPa. AA

784

Ravichandran (R) and Parthiban (R). **The impact of processing techniques on tea volatiles.** *Food Chemistry* 62(3); 1998; 347-353

The impact of various cultural and manufacturing techniques on volatile flavour composition was studied in order to optimize the conditions for production and retention of aroma in relation to tea quality. The Flavour Index was in the order: clonal variation-Assam > Cambod > China Shoot maturity-Bud + 1st leaf > 2nd leaf > 3rd leaf; plucking interval 7 day > 14 day; processing-green leaf > withered leaf-fermented dhool < dried tea < tea brew; withering-soft < normal < hard. VFC Group I was in general dominated by trans-2-hexenal and Group II by linalool, phenylacetaldehyde and geraniol. Fresh green leaf had a high content of hexanol, hexanal, hexenol, hexenal and methyl salicylate. Upon withering, a sharp increase in Group I was noticed, the most remarkable being in hexenol. Group II also increased, but the extent was less except for linalool. During fermentation, Group I alcohols showed a sharp reduction with concomitant increases in aldehydes, especially trans-2-hexenal. In Group II, all compounds increased except methyl salicylate and the ionones. In the firing stage, high losses of Group I and Group II were registered. All the Group I compounds showed a decline with the progress of withering, but the opposite applied to Group II compounds, except for the alcohols. Mechanical injury during handling of leaf before cutting increased the Group I content enormously. The addition of exogenous fatty acids, mainly linoleic acid, produced substantial amounts of Group I compounds, dominated by trans-2-hexenal and hexanal. The inhibition of lipoxygenase totally reduced the formation of Group I volatiles. AA

785

Vickers (Z) and Holton (E). **A comparison of taste test ratings, repeated consumption, and postconsumption ratings of different strengths of iced tea.** *Journal of Sensory Studies* 13(2); 1998; 199-212

One objective of this study was to compare taste test ratings with amounts consumed and postconsumption ratings made as iced teas of different strengths were repeatedly consumed. The second objective was to determine whether sensory specific satiety could be used as a rapid indicator of long term acceptability of the teas. Subjects first rated their liking of and the flavour intensity of several samples of lemon flavoured iced tea. Two tea concn. were selected from this test to represent distinctly different flavour intensities. Taste test liking ratings of the strong concn. were higher than those of the weak concn. Subjects consumed either the strong or the weak iced tea ad lib on 20 different afternoons over a 2 month period and rated their liking of the tea after each session. The amount of tea consumed each time was measured. On repeated consumption the subjects liked the weaker tea better than the stronger tea. Subjects consumed about the same amount of each tea. A different group of 15 subjects participated in a sensory specific satiety study of the same two teas. Those subjects drank more of the weak tea than the strong tea. AA

786

Ravichandran (R) and Parthiban (R). **Changes in enzyme activities (polyphenol oxidase and phenylalanine ammonia lyase) with type of tea leaf and during black tea manufacture and the effect of enzyme supplementation of dhool on black tea quality.** *Food Chemistry* 62(3); 1998; 277-281

Variation in polyphenol oxidase (PPO) and phenylalanine ammonia lyase (PAL) activities with respect to different cultural and manufacturing processes and their effects on black tea quality were studied. There was a wide variation between enzyme activities of different clones, as well as variation due to seasonal changes and shoot maturity. Field practices such as plucking rounds and pruning had a great impact on enzyme activities. The enzyme activities positively correlated with taster's scores. The extent of change in enzyme activities at different stages of manufacture differed widely. The loss of activity during withering could be restored by rehydration. Residual activity was observed in made tea. Supplementation of enzymes enhanced the black tea quality markedly in terms of cuppage and creaming properties. AA

FATS AND OILS

787

Seriburi (V) and Akoh (CC). **Enzymatic transesterification of triolein and stearic acid and solid fat content of their products.** *Journal of*

the American Oil Chemist's Society 75(4); 1998; 511-516

Two systems were investigated and compared as models for making margarine-type fats. Two immobilized lipases, IM60 from *Rhizomucor miehei* and SP435 from *Candida antarctica*, were used to catalyze the transesterification of triolein with stearic acid and stearic acid methyl ester, resp., in n-hexane. The optimal reaction temp. for both enzymes was 55°C at a mole ratio of triolein to acyl donor of 1:2. Equilibria were reached at 18 h for IM60 and 24 h for SP435. Analysis of the overall yield and incorporation of fatty acid at the sn-2 position indicated that the triacylglycerol products contained 38.4 and 16.2% 18:0 for acidolysis and 34.2 and 11.3% for interesterification reactions, resp., at the 2-position. With SP435, the softest fat was produced after 18 h of incubation, and the hardest after 30 h. For IM60 system, 18 h of incubation gave the most plastic fat. AA

788

Frykman (HB), Snyder (JM) and King (JW). **Screening catalytic lipase activities with an analytical supercritical fluid extractor.** *Journal of the American Oil Chemist's Society* 75(4); 1998; 517-520

Two different screenings of several commercial lipases were performed to find a lipase with superior performance for the conversion of lipid moieties to their fatty acid methyl ester (FAME) derivatives under supercritical conditions. The first screening was done under hydrolytic conditions in a buffer. The second screening was done under supercritical conditions with CO_2, utilizing some of the same lipases for the methanolysis of different lipids. For the substrates studied, there was a significant difference in lipase activity under the two above conditions. Significant hydrolytic activity was demonstrated for three different lipid types (triglycerides, sterols, and phospholipids) with lipase PS30, but when the same lipase was immobilized on an Accurel carrier (polypropylene), the activity decreased considerably. The opposite was found for lipase G, which showed strong activity when immobilized and under supercritical conditions. Furthermore, chirozyme L-1 was superior under supercritical conditions. The altered substrate specificity that some of these lipases show in supercritical CO_2 suggests several interesting synthetic options and applications under these conditions. AA

789

Ranhotra (GS), Gelroth (JA) and Leinen (SD). **Energy value of a fat high in stearic acid.** *Journal of Food Science* 63(2); 1998; 363-365

A fat containing 92.1% stearic acid (tristearin) was evaluated for energy value using shortening (9 kcal/g) and mineral oil (0 kcal/g) as controls and young rats as the test model. Energy value was calculated based on efficiency of conversion of estimated gross energy intake to carcass energy over a 3-wk. period. Rats fed the shortening-based diet deposited more than double the fat and significantly more protein in the carcass than rats fed the tristearin-based diet. Rats fed the tristearin-based diet deposited significantly more fat and protein than rats fed the mineral oil-based diet. Based on these observations, the estimated energy value of tristearin was calculated as 3 kcal/g. AA

790

Loisel (C), Keller (G), Lecq (G), Bourgaux (C) and Ollivon (M). **Phase transitions and polymorphism of cocoa butter.** *Journal of the American Oil Chemist's Society* 75(4); 1998; 425-439

The phase transitions and polymorphism of cocoa butter (CB) were examined separately by differential scanning calorimetry (DSC) and X-ray diffraction as a function of temp. (XRDT) at scanning rates between 0.1 to 5°C/min and 0.1 to 2°C/min. A new instrument which allowed simultaneous DSC and XRDT recordings from the same sample by taking advantage of the high energy flux of synchrotron, was employed for the characterisation of the intermediate phase transitions. These technique confirmed the existence of 6 polymorphic films of CB. GS

Oils

791

Petrauskaite (V), Greyt (WD), Kellens (M) and Huyghebaert (A). **Physical and chemical properties of trans-free fats produced by chemical interesterification of vegetable oil blends.** *Journal of the American Oil Chemist's Society* 75(4); 1998; 489-493

Fat blends, formulated by mixing a highly saturated fat (palm stearin or fully hydrogenated soybean oil (FHSO)) with a native vegetable oil (soybean oil) in

different ratios from 10:90 to 75:25 (wt.%), were subjected to chemical interesterification reactions on laboratory scale (0.2% sodium methoxide catalyst, time = 90 min, temp. = 90°C). Starting and interesterified blends were investigated for triglyceride composition, solid fat content, free fatty acid content, and trans fatty acid (TFA) levels. Obtained values were compared to those of low- and high-trans commercial food fats. The interesterified blends with 30-50% of hard stock had plasticity curves in the range of commercial shortenings and stick-type margarines, while interesterified blends with 20% hard stock were suitable for use in soft tubtype margarines. Confectionery fat basestocks could be prepared from interesterified fat blends with 40% palm stearin or 25% FHSO. TFA levels of interesterified blends were low (0.1%) compared to 1.3-12.1% in commercial food fats. AA

792

Michalski (M-C), Desobry (S), Pons (M-N) and Hardy (J). **Adhesion of edible oils to food contact surfaces.** *Journal of the American Oil Chemist's Society* 75(4); 1998; 447-454

The relationship between the thermodynamic work of adhesion (WA) and the wt. of fatty food remaining on packaging material after drainage flow, was studied. Food-contact surfaces were LDPE, polyethylene teraphthalate, stainless steel and glass. The dispersive, polar, acid-base and hydrogen surface tension components of oils and solids were calculated. Two models involving surface tensions hydrogen component and a linear dependence of WA on the liquid polar surface tension component, fitted best with oil bulk adhesion. GS

793

Woodbury (SE), Evershed (RP) and Russell (JB). **Purity assessments of major vegetable oils based on $\delta^{13}C$ values of individual fatty acids.** *Journal of the American Oil Chemist's Society* 75(3); 1998; 371-379

The fatty acid compositions and $\delta^{13}C$ values of the major fatty acids of more than 150 vegetable oils were determined by capillary GC and GC combustion-isotype ratio MS resp. Fatty acid compositions were within the ranges specified by the codex-Alimentarius. Pure maize oils and potential adulterant oils from various parts of the world were also studied to assess the sources of variability in $\delta^{13}C$ values. Variability in δ^{13} values was related to the geographical origin of the oil, year of harvest and the var. of the oil. BV

794

Anon. **pH-Metric determination of the acid value of vegetable oils without titration.** *Journal of AOAC International* 81(4); 1998; 873-879

The acid value (AV) of vegetable oils is determined without titration by using a new reagent consisting of triethanolamine in a sol. of water and isopropyl alcohol. When the oil sample is mixed with the reagent in the pH-metric cell, free fatty acids from the sample are extracted into the reagent (3-4 min). The initial pH, called conditional pH'_1, is measured, a standard acid (HCl) is added, and the final pH, pH'_2, is measured. AV is calculated from the difference between pH'_1 and pH'_2. The method is applicable for quality control of vegetable oils during their production, trade, and use. AA

Palm oils

795

Baharin (BS), Rahman (KA), Karim (MIA), Oyaizu (T), Tanaka (K), Tanaka (Y), Takagi (S). **Separation of palm carotene from crude palm oil by adsorption chromatography with a synthetic polymer adsorbent.** *Journal of the American Oil Chemist's Society* 75(3); 1998; 399-404

A separation technique for carotene extraction from crude palm oil (CPO), that maintains an edible quality was developed. Palm carotene was conc. from CPO by a single-stage chromatographic process on a synthetic porous polymer. Carotene was conc. to about 10^5 ppm sol. Carotene recovery varied from 40 to 65% depending upon the chromatographic conditions. Fatty acid composition of the palm oil did not change during the carotene recovery process. Adsorption isotherms of the adsorbent differed from other adsorbents. This new recovery method for palm carotene may be suitable as an edible palm oil pretreatment process due to its efficient mass recovery of a valuable bioresource. GS

Sesame oils

796

Mohamed (HMA) and Awatif (II). **The use of sesame oil unsaponifiable matter as a natural antioxidant.** *Food Chemistry* 62(3); 1998; 269-276

Individual components of sesame oil unsaponifiable matter isolated from two different coloured seed var. (white and brown) were identified and quantified. Unsaponifiables from the brown sesame var. were markedly different in their composition from those of the white var. The brown var. contained higher amounts of total sterols and tocopherols but lower amounts of sesamin, sesamolin and total hydrocarbons than the white var. The seeds were roasted at 180°C for 30 min. Roasting increased some effective antioxidant compounds. These included relatively higher percentages of sesamol, $\Delta^{24,28}$ ethylidene sterols (Δ^5 and Δ^7-avenasterols), squalene, as well as tocopherols and some active browning substances. These antioxidative components are effective via synergistic action. Additionally, unsaponifiable matter from unroasted (USM) and roasted white sesame seeds (RSM) was added individually to sunflower oil at levels of 0.02, 0.05 and 0.1% and their effectiveness was compared with a control (no additives) at 63°C. Results indicated that both USM and RSM had antioxidant activity which increased with increasing concn. Compared to USM, the RSM was a better antioxidant in most cases. Moreover, the addition of 0.1% RSM gave a strong antioxidative efficiency and this could be used as an alternative natural antioxidant for food applications. AA

Soybean oils

797

Zayed (SMAD), Farghaly (M) and Mahdy (F). **Effect of commercial processing procedures on carbofuran residues in soybean oil.** *Food Chemistry* 62(3); 1998; 265-268

Dry seeds of soybean from ^{14}C-carbofuran-treated plants contained about 1% of the originally applied radioactivity. Extraction of the seeds with hexane and methanol left 50% of the ^{14}C in the cake. Analysis of residues showed the presence of free products in the oil and conjugated metabolites in the methanol extract. The free substances were identified as carbofuran and its phenol. The percentage of the latter increased during the successive refining processes. The refined oil had only 16% of the radioactivity originally present. The methanol extract contained four glucosides, mostly those of 3-hydroxy carbofuran. Refining soybean oil fortified with ^{14}C-carbofuran reduced the residue in the oil by 78%. Most of the residue remaining was carbofuran. AA

SPICES AND CONDIMENTS

Essential oils

Olive oils

798

Bianco (A), Mazzei (RA), Melchioni (C), Scarpati (ML), Romeo (G), Uccella (N). **Microcomponents of olive oil: Part II. Digalactosyldiacylglycerols from *Olea europaea*.** *Food Chemistry* 62(3); 1998; 343-346

Two galactolipids, 1 and 2, were isolated and identified both in olive fruits and in olive oil. They are characterized by a low polarity, despite the presence of a diglycosidic unit, giving, in water, micelles. Because of this characteristic, compounds 1 and 2 could be responsible for the stability of the light emulsion typical of freshly produced olive oil. The presence of hydrophilic ortho-diphenolic compounds enhances the antioxidant properties of this oil, particularly in the first period after the production. In addition, the functions present in 1 and 2 are susceptible to hydrolysis and may be easily modified in the alkaline treatment used for the olive oil refining process. For this reason, their presence in olive oil may be a very useful indication of the untreated food product. AA

Spices

799

Hershko (V), Weisman (D) and Nussinovitch (A). **Method for studying surface topography and roughness of onion and garlic skins for coating purposes.** *Journal of Food Science* 63(2); 1998; 317-321

Surface topography and roughness of garlic and onion skins were studied by atomic force microscopy in order to estimate the surface area. Image-processing and Arc/Info software were used

to interpret the data. The calculated ratio between apparent and measured surfaces (roughness factor) deviated from 1.11 to 1.15 for untreated and chloroform-treated onion skin, resp. For garlic, higher values were detected for the untreated skin. The higher the roughness factor, when the coating sol. are easily spread on the fruit or vegetable surfaces, the better the adhesion between coating and skin. A knowledge of true surface areas can help to better estimate required coating-sol. vol. AA

SENSORY EVALUATION

800

Suwonsichon (T), Normand (MD) and Peleg (M). **Estimation of the mechanical properties of individual brittle particles from their bulk compressibility.** *Journal of Texture Studies* 28(6); 1997; 673-686

Two puffed cereal particles were compressed both individually and in cells of different diam. and heights. The degree of jaggedness of their force-displacement curves were expressed in terms of their apparent fractal dimension determined from the Richardson plot and by the box counting method (Kolmogorov's dimension). Plots of the degree of jaggedness vs. cell diam. and height produced approx. planar relationships in a three dimensional space. Their extrapolation to the individual particle characteristic dimensions gave jaggedness values in agreement with those determined experimentally on the individual particles. This demonstrates that it is possible, at least in certain products, to assess the "brittleness" of individual particles from their bulk compressibility pattern. The same procedure could also be used to estimate the particle "stiffness" expressed in terms of the force at a preselected displacement level (e.g., 15 or 25%). AA

801

Ibanoglu (S) and Ibanoglu (E). **Rheological characterization of some traditional Turkish soups.** *Journal of Food Engineering* 35(2); 1998; 251-256

The rheological behaviour of three traditional Turkish soups was studied at different temp. (15-70°C), using a Brookfield viscometer. Results showed that an increase in shear rate resulted in a decrease in apparent viscosity, suggesting pseudoplastic behaviour with flow indices, n, between 0.30 and 0.43. Viscosity decreased with temp. and was described by the Arrhenius equation with activation energies between 15,039 and 20,160 kJ mol^{-1}. AA

802

Caballero (JA), Marcilla (A) and Garcia (JC). **Mathematic modelling of the rheological behaviour of the paste of 'Xixona Turron' during the cooking process.** *Journal of Food Engineering* 34(3); 1997; 315-329

A kinetic study of the change in viscosity of 'Xixona Turron' during the manufacturing process has been carried out. An oscillatory test has been used with programmed heating rates of 2, 5 and 10°C min^{-1}, amplitudes of oscillation between 0.01 and 0.05 cm and frequencies between 0.2 and 1 s^{-1}. Important changes in the structure of the paste are observed during the cooking process of the paste of 'Xixona Turron'. Initially the paste is a suspension of solid caramel and almond flour in a continuous oil phase. When the paste is heated the caramel melts and disperses into the paste which undergoes a restructuration (phase inversion). All these processes cause important changes in the viscosity of the paste which can be used to monitor the evolution of the overall process. A mathematical model that predicts the evolution of the viscosity with time-temp. is proposed. AA

803

Huang (Y-T) and Lawless (HT). **Sensitivity of the ABX discrimination test.** *Journal of Sensory Studies* 13(2); 1998; 229-239

804

Navarro (AS), Martino (MN) and Zaritzky (NE). **Viscoelastic properties of frozen starch-triglycerides systems.** *Journal of Food Engineering* 34(4); 1997; 411-427

Dynamic rheological methods are useful to determine the stability of starch-based products submitted to different processing conditions. A dynamic oscillatory test covering a wide range of strain values was used to analyse the behaviour of corn and waxy starch (7 and 10% w/w) pastes with and without triglycerides (5% w/w) or xanthan gum (0.03%). The effect of freezing rate on the structure stability was analysed using a slow freezing rate of 0.3 cm/h and a rapid one of 31 cm/h. After slow freezing dynamic parameters (G', G'', tan δ) showed

an increase in the rigidity of the pastes and a structural breakdown with a marked stress decay compared with the unfrozen or rapid frozen samples. The linear viscoelastic range of starch pastes decreased after rapid or slow freezing, showing that the paste structure cannot resist large deformations without undergoing irreversible breakdown. Pastes with lipids showed an increase of the linear viscoelastic range and higher values of G' compared with the control without lipids. The presence of triglycerides in frozen starch pastes led to a decrease of the solid component G' of the starch pastes, in addition, a less fluid character after structural breakdown was observed as well. A minor increase in rigidity after slow freezing was observed in pastes with sunflower oil, as compared with pastes containing a shortening with a more saturated fatty acid composition. AA

805

Zamora (MC), Buratti (FM) and Otero-Losada (ME). **Temporal study of sucrose and fructose relative sweetness.** *Journal of Sensory Studies* 13(2); 1998; 213-228

Time-intensity (TI) and Gustatory Reaction Time (GRT) methodologies were used to study the relative sweetness of sucrose and fructose at 25°C. Eleven panelists evaluated nine concn. (5 to 45%, w/v) of sucrose and fructose by TI and seven parameters were determined. Higher values were obtained for fructose at 25, 30 and 35% for Max. Intensity; at 35, 40 and 45% for the Area Under the Curve; at 40 and 45% for time to decline the intensity to half of its max. value and at 45% for rate of increase. Ten subjects evaluated seven concn. (3 to 15%, w/v) of sucrose and fructose by the GRT procedure. Fructose had shorter GRT than sucrose at 3 and 4.5%. Thus, fructose at 25, 30 and 35%, has a more intense and at 40% more persistent sweetness than sucrose and is detected earlier than sucrose at concn. near gustatory threshold. AA

806

Epler (S), Chambers (E) and Kemp (KE). **Hedonic scales are a better predictor than just-about-right scales of optimal sweetness in lemonade.** *Journal of Sensory Studies* 13(2); 1998; 191-197

A comparison of hedonic scales and just-about-right (JAR) scales is needed bacause data in previous studies using JAR scales suggest that predicted optimum levels of ingredients often are not the same as the levels in products that currently are sold successfully. Thus, in this research, consumers tested lemonade varying in sugar concn. from 6% to 14%, using (1) a JAR scale formed by boxes or a line and (2) a hedonic box-type scale. Predicted "optimum" levels of sweetness for the lemonade and differences in liking for the formulations were determined. The JAR line and box scales gave similar predicted optimal results (9.2% and 9.4% sucrose, resp.), which were significantly lower than the hedonic scale results (10.3% sucrose). In a preference test, consumers significantly preferred the 10.3% sugar lemonade over the 9.3% concn., indicating that, based on paired preference testing, the hedonic scale resulted in better prediction of optimal sweetness than the JAR scale. AA

807

Rousseau (B), Meyer (A) and O'Mahony (M). **Power and sensitivity of the same-different test: Comparison with triangle and duo-trio methods.** *Journal of Sensory Studies* 13(2); 1998; 149-173

Same-different, duo-trio and triangle discrimination methods were compared using vanilla flavoured yoghurt with and without added sugar as the medium. Two experiments were performed, one in controlled laboratory conditions and the other in conditions approximating more to consumer testing. A modification of the same-different test had greater power than the duo-trio of triangle tests. At higher sugar concn., d'values for the three methods were equivalent. Yet, at lower sugar concn., the same-different d' tended to be higher. The results are discussed in terms of Sequential Sensitivity Analysis, memory effects and changes between β and τ criteria. AA

808

Ross (EW), Shaw (CP) and Friel (M). **Colour measurement as predictor of consumer ratings of military ration items.** *Journal of Food Quality* 20(5); 1997; 427-439

Instrumental colour measurements were investigated as a methods of assessing ration quality after long term storage. Six items were stored at 5 temp. from 4 to 60°C and withdrawn after 7, 31, 91, 182, 365, 730 and 1095 days. They were assessed for colour (CIELAB $L^* a^* b^*$ values, hue angle and chroma), consumer acceptance (CA), and attribute ratings. Colour variables varied consistently for only

applesauce and cheese spread. L* values were investigated to measure acceptability. CA ratings were divided into two equal sets. The first was used to determine the relationship between the mean score and L* value, then to predict acceptability. Predictions were compared to the second set of scores and type 1 and 2 error rates determined. Although error rates were high by usual statistical standards, they were equal to or lower (although not significantly different) than those based on the mean CA score. AA

FOOD STORAGE

809

Ahrne (LM), Oliveira (FAR), Manso (MC), Drumond (MC), Oste (R), Gekas (V). **Modelling of dissolved oxygen concentration during storage of packaged liquid foods.** *Journal of Food Engineering* 34(2); 1997; 213-224

A mathematical model that combines oxygen uptake from the outside environment with oxygen consumption by oxidative reactions, in a liquid packed food during storage, was developed. The model was applied to orange juice aseptically packaged in Tetra Brik Aseptic cartons, during storage of up to 5 months at 4, 8, 20, 30, 40 and 50°C. The parameters of the model, the oxygen mass transfer coeff. and the rate constant of consumption reactions, were estimated by fitting the model to the experimental data. The value of the rate constant estimated for the system tested in this work, was three orders of magnitude greater than the value of the oxygen mass transfer coeff. The influence of temp. on the reaction rate was well described by an Arrhenius type equation, with an activation energy of 46 kJ/mole. This model was further tested with data reported in literature and it was found that it adequately describes the dissolved oxygen concn. changes during storage. AA

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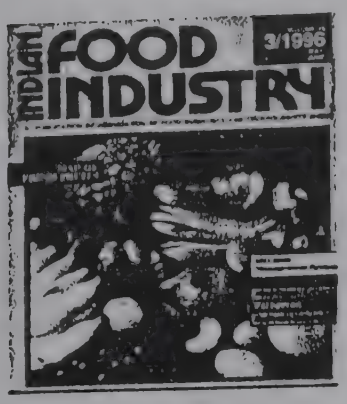

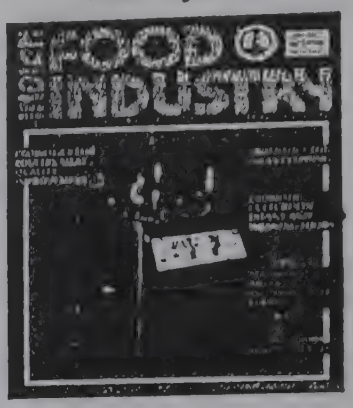

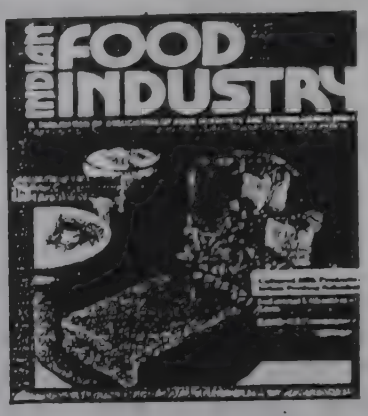

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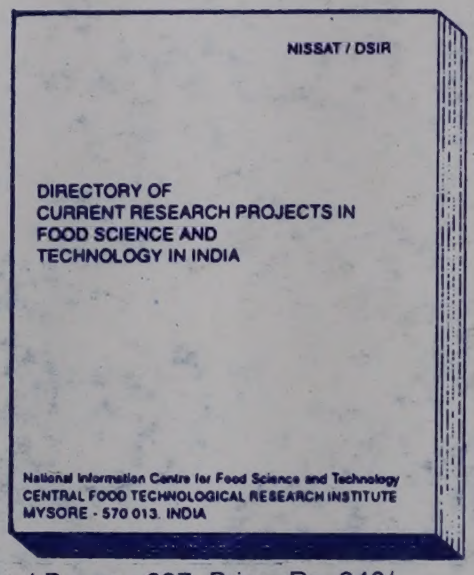

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